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Magnetic Therapy

Plausible Attraction?

Catching Up with Eighteenth Century Science

Therapeutic Touch and Anton Mesmer

Media Depictions of the Paranormal

How Do They Affect What People Believe?

Planting a Seed of Doubt

Essiac, the Not-So-Remarkable Cancer Remedy

SPECIAL REPORT

Mars Surveyor Photographs
The 'Face on Mars'

Published by the Committee for the Scientific Investigation of Claims of the Paranormal

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EDITOR'S NOTE

Adventures in the Broadcast Jungle

I've been doing some radio shows lately. No big deal. I've done them before. But one recent experience was, I think, symbolic of too much of what's gone wrong with the broadcast media—and much else—today.

The ostensible topic of these interviews is the latest anthology of SKEPTICAL INQUIRER articles. The book is *Encounters with the Paranormal: Science, Knowledge, and Belief,* and it was published in April by Prometheus Books (see New Books, this issue, page 53). Forty-five authors, including the late Carl Sagan, Martin Gardner, two Nobel laureates, and a host of other distinguished figures in science and skepticism, contributed to the book. But my name is on the cover as Editor, so I get the calls.

One request came from a radio station in a major American city. I'll not be more specific. The producer who called seemed normal, and a date and time was set.

I knew I was in trouble before the show even started. After they call they put you on hold for a few minutes until time for your segment, and you can hear the show in progress. It had "Madness" in the title, and that wasn't a misnomer. The three hosts—two men and a woman—were shock-jocks. Their stock in trade, apparently, is insults. The atmosphere is drunken college party (*Animal House* variety). I heard the three of them mocking and laughing maniacally about actor Christopher Reeve's paralysis. Then the lead host began referring repeatedly to some woman (a previous guest?) as a whore. Then they asked a caller his drink preference of the morning (it was 9:05 a.m., and they didn't mean nonalcoholic). All this is accompanied with great whooping and hollering. Not a good sign.

With no intro or civilities, the host then opened with just the challenging, "Ken Frazier, editor of *Encounters with the Paranormal,* do you believe in the paranormal?" As you might realize, without any context or explanation, that's a tough question to start with. I tried to say that we urge that belief be based on evidence. He would have none of it. He interrupted me. I tried again. "You're avoiding the question!"

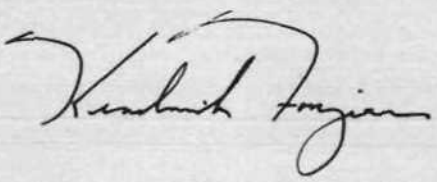
I tried to give the book's subtitle—my original preference for the title and reflective of our emphasis on science. He countered that he knew the subtitle and asked if I knew the subtitle on a Miller beer bottle.

What little he let me say he didn't like. To one attempted answer he sneered, "Are you wearing a dress?" (I *think* this is another way of asking "What planet are you from?" but I'm not sure.) The one substantive question in our brief encounter was "Why has there been such a rise in Satanic ritual abuse cases?" When I tried to answer that such reports are frequently exaggerated, both men jumped on me and said they themselves had seen these altars and ritual murder scenes with decapitated babies, and so on. They made it plain they considered me a fool for having any doubts.

The whole thing ended abruptly. They asked the usual, "Have you found *anything* that's real?" I decided to answer facetiously that the unanswered mystery that puzzles me most is what happens to the socks I put in the dryer. They cut me off.

Now don't worry about me. I've been in this business for years. I know the score. But the experience is emblematic of the cultural state in which people who care about science—indeed who care about any important issues—must frequently work.

But I'm a natural optimist. A few days later I was on another radio show. This one was on a nationwide network of 55 stations. The host was pleasant, asked good questions, allowed me to make my points and complete my thoughts, seemed genuinely interested in science, and even laughed at some of my stories. (The one above wasn't among them). Our segment was supposed to last 30 minutes, but halfway into it he asked if I could stay 15 minutes longer. This one went well. So, yes, it can be a jungle out there, explaining science to the public. The good news is you're not always eaten.



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National Academy of Sciences:
Evolution Must Be Taught If Students Are to Understand Modern Biology

For all those battling on behalf of science education in the evolution/creationism wars, it was welcome. High-level scientific reinforcement arrived in the form of a strongly worded report from the National Academy of Sciences, perhaps the nation's most prestigious scientific organization.

Evolution must be a vital part of science instruction, and lessons on creationism do not belong in science classes, the Academy said in a report issued at a news conference in Washington April 9. It said evolution is supported by "overwhelming evidence."

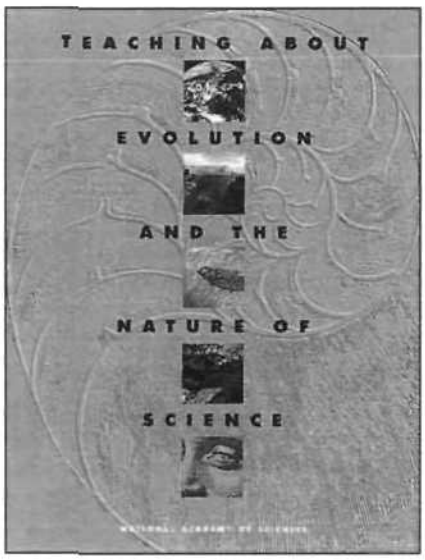
The Academy is a private, nonprofit organization of many of the nation's most distinguished scientists operating under a 135-year-old congressional charter to provide scientific advice to the federal government.

The Academy said it feels strongly enough about the topic that it is issuing a guidebook for teachers that details how evolution should be discussed with students and how sensitive questions, including those from parents, can be answered. The book calls evolution the most important concept in biology. Evolution must be taught in the public schools if children are to understand biology at all, the panel said.

The guidebook, *Teaching About Evolution and the Nature of Science,* is intended to provide educators and policy-makers with tools to help integrate lessons about the scientific theory with basic biology for children in kindergarten through grade 12. It was written by a group of prominent scientists and educators (among them CSICOP Fellow Eugenie Scott) who have been involved extensively in education and research on evolution.

"The widespread misunderstandings about evolution are of great concern to the scientific community and the Academy," said Bruce Alberts, NAS president and one of the book's authors. "Evolution is the central organizing principle that biologists use to understand the world.

"If we want our children to have a good grasp of science, we need to help teachers, parents, school administrators, and policy-makers understand both evolution and the nature of science. They also must recognize that many scientists are religious people, and that religion and science represent different approaches to understanding the human condition that are not incompatible with each other."



Nevertheless, scientific knowledge and religious faith are different, the report stresses, and it is important to understand those distinctions.

Teaching evolution is essential for explaining some of the most fundamental concepts of science, the guidebook says. Like all scientific theories, evolution explains natural phenomena by building logically on observations that can be tested and analyzed.

"Biology simply cannot be taught well without covering evolution," said Donald Kennedy, a co-author of the guidebook and Bing Professor of Environmental Studies at Stanford University. "Students who understand the process of evolutionary change are able to grasp its vital practical consequences, such as how bacteria develop resistance to antibiotics. A failure to teach effectively about evolution will rob students of a precious opportunity—to understand how life on Earth has developed and to appreciate their own place in the world."

The Academy noted that many public school students receive little or no exposure to the theory of evolution. It said teachers are reluctant to teach evolution because of pressures from special-interest groups to downplay or eliminate it as part of the science curriculum. Moreover, some are advocating that creationism be taught in public schools—even though the Supreme Court ruled in 1987 that creationism is a religious idea that cannot be mandated in public education.

The Academy also said people and groups opposed to evolution for religious reasons have persuaded some textbook publishers to downplay or eliminate treatments of evolution and have pushed legislation and policies at the state and local levels to discourage the teaching of evolution.

"The widespread misunderstandings about evolution and the conviction that creationism should be taught in science classes are of great concern to the National Academy of Sciences," the report says.

The Academy and its affiliated institutions, including the National Research Council and the Institute of Medicine, have sought to counter misinformation about evolution because "of the enormous body of data supporting evolution and because of the importance of evolution as a central concept in understanding our planet."

The guidebook:

- summarizes the massive amount of scientific evidence in support of evolution and suggests effective ways of teaching it;
- explains the nature of science and

Conceptions and Misconceptions:
Questions and Answers

The new National Academy of Sciences report *Teaching About Evolution and the Nature of Science* includes a very useful chapter of eighteen questions frequently raised about evolution and the Academy panel's answers. Here are three excerpts:

Is evolution a fact or a theory?

The theory of evolution explains how life on earth has changed. In scientific terms, "theory" does not mean "guess" or "hunch" as it does in everyday usage. Scientific theories are explanations of natural phenomena built up logically from testable observations and hypotheses. Biological evolution is the best scientific explanation we have for the enormous range of observations about the living world.

Scientists most often use the word "fact" to describe an observation. But scientists can also use fact to mean something that has been tested or observed so many times that there is no longer a compelling reason to keep testing or looking for examples. The occurrence of evolution in this sense is a fact. Scientists no longer question whether descent with modification occurred because the evidence supporting the idea is so strong.

Don't many famous scientists reject evolution?

No. The scientific consensus around evolution is overwhelming. Those opposed to the teaching of evolution sometimes use quotations from prominent scientists out of context to claim that scientists do not support evolution. However, examination of the quotations reveals that the scientists are actually disputing some aspect of how evolution occurs, not whether evolution occurred. For example, the biologist Stephen Jay Gould once wrote that "the extreme rarity of transitional forms in the fossil record persists as the trade secret of paleontology." But Gould, an accomplished paleontologist and eloquent educator about evolution, was arguing about how evolution takes place. He was discussing whether the rate of change of species is constant and gradual or whether it takes place in bursts after long periods when little change occurs—an idea known as punctuated equilibrium. As Gould writes in response, "This quotation, although accurate as a partial citation, is dishonest in leaving out the following explanatory material showing my true purpose—to discuss rates of evolutionary change, not to deny the fact of evolution itself."

Gould defines punctuated equilibrium as follows:

> Punctuated equilibrium is neither a creationist idea nor even a non-Darwinian evolutionary theory about sudden change that produces a new species all at once in a single generation. Punctuated equilibrium accepts the conventional idea that new species form over hundreds or thousands of generations and through an extensive series of intermediate stages. But geological time is so long that even a few thousand years may appear as a mere "moment" relative to the several million years of existence for most species. Thus, rates of evolution vary enormously and new species may appear to arise "suddenly" in geological time, even though the time involved would seem long, and the change very slow, when compared to a human lifetime.

Aren't scientific beliefs based on faith as well?

Usually "faith" refers to beliefs that are accepted without empirical evidence. Most religions have tenets of faith. Science differs from religion because it is the nature of science to test and retest explanations against the natural world. Thus, scientific explanations are likely to be built on and modified with new information and new ways of looking at old information. This is quite different from most religious beliefs.

Therefore, "belief" is not really an appropriate term to use in science, because testing is such an important part of this way of knowing. If there is a component of faith to science, it is the assumption that the universe operates according to regularities—for example, that the speed of light will not change tomorrow. Even the assumption of that regularity is often tested—and thus far has held up well. This "faith" is very different from religious faith.

Science is a way of knowing about the natural world. It is limited to explaining the natural world through natural causes. Science can say nothing about the supernatural. Whether God exists or not is a question about which science is neutral.

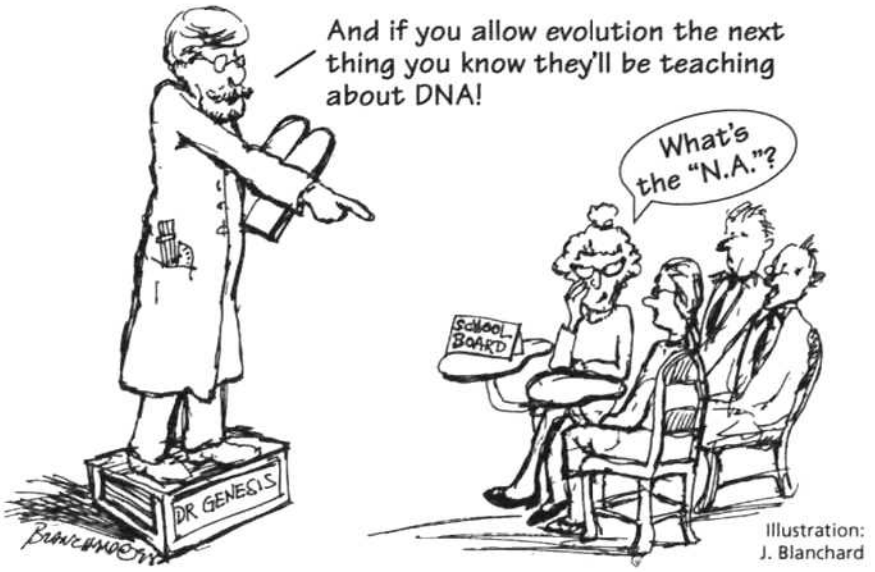


Illustration: J. Blanchard

how it differs from other ways of knowing about the natural world;

- provides eight sample activities that teachers can use to develop students' understanding of evolution and scientific inquiry; and
- answers some of the most frequently asked questions about the scientific, legal, and educational issues surrounding the teaching of evolution (see "Conceptions and Misconceptions: Questions and Answers" on page 6).

The guidebook does not attempt to refute the ideas of those who oppose the teaching of evolution. Instead, it points out that most religious denominations in the United States do not view evolution as being at odds with their understanding of human origins.

The Academy says the idea that the entire universe was created all at once about 10,000 years ago—an idea inherent in "creation science"—is not supported by scientific data. In contrast, it says the concept of evolution is unquestioned by almost all scientists.

Many who oppose teaching evolution charge that it is "just a theory, not a fact," and should be taught as such in the classroom. But the Academy points out in several sections of the report that scientists do not use the word "theory" to describe an unsubstantiated idea. In science, theories are explanations based on a large body of established facts. It emphasizes that the debate about evolution in the scientific community is focused on the details of how evolution occurs, not whether it occurs. It adds that nearly all scientists agree that biological evolution is the most sound theory to explain the diversity of life.

Science teachers can use the new publication in conjunction with the National Science Education Standards—voluntary guidelines introduced three years ago by the National Research Council to help students achieve scientific literacy through improving what is taught, how it is taught, and how students are assessed. The Academy says the science standards stress the importance of evolution because understanding it is essential to mastering basic biology and learning how science works. *Teaching About Evolution and the Nature of Science* also provides criteria for evaluating school science programs and the content and design of instructional materials.

The project was funded by the Howard Hughes Medical Institute, the Esther A. and Joseph Klingenstein Fund Inc., and the Council of the National Academy of Sciences.

*Copies of *Teaching About Evolution and the Nature of Science* are available from the National Academy Press, 2101 Constitution Ave. NW, Washington, DC 20036; tel. (202) 334-3313 or 1-800-624-6242. The complete guidebook is also available on the World Wide Web at www.nap.edu/readingroom/books/evolution98. The cost of the report is $19.95 (prepaid) plus shipping charges of $4 for a single copy; discounts available for bulk orders.

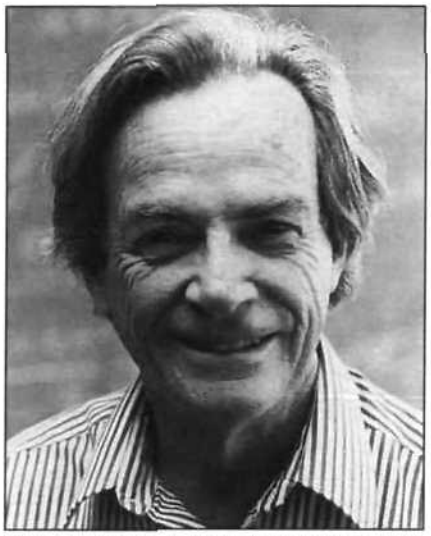
Feynman Speaks From Grave to Debunk Paranormal

Richard Feynman didn't believe that anyone could ever speak from the grave. But he has.

Feynman, the Nobel laureate physicist who gained popular fame as a member of the presidential commission on the Challenger disaster, died in 1988. Since then he has been the author of several posthumous publications, compiled from his talks and classroom lectures. There have been volumes of Feynman on gravitation, Feynman on computation, and now, Feynman on *The Meaning of It All.* That latest book, published by Addison-Wesley, is based on a series of three public lectures Feynman delivered at the University of Washington in 1963. He presented a physicist's view of science and society, politics and the paranormal, with observations as astute and pertinent now as then.

Science, Feynman said, means different things. It can mean knowledge about nature. It can also mean the things you can do with that knowledge, but that meaning is better reserved for the term technology. Feynman liked to emphasize a third meaning of science—the process of acquiring information about how the world works.

"Science," said Feynman, means "a special method of finding things out." And that method is special in its devotion to the principle that observation is the judge of what is so. "All other aspects and characteristics of science can be understood directly when we understand that observation is the ultimate and final judge of the truth of an idea," Feynman said. Testing an idea, or a rule, means



Richard Feynman. Caltech photo by Robert Paz.

looking for exceptions. Except in science, the exception does not prove the rule.

"The exception tests the rule." Or, put another way, "The exception proves that the rule is wrong." It's the principle of science—if observation proves an exception to a rule, that rule is invalid. It is observation, then, that determines the truth of claims of supernatural events or abilities, Feynman asserted. Fans of the paranormal often frame the argument differently, though, insisting that science can't prove that things like ESP or UFOs are impossible. Feynman countered that the important issue is not possibility, but actuality.

"The problem is not to demonstrate whether it's possible or not but whether it's going on or not," he said. "The problem is not what is possible. . . . The problem is what is probable, what is happening. It does no good to demonstrate again and again that you can't disprove that this could be a flying saucer. We have to guess ahead of time whether we have to worry about the Martian invasion. We have to make a judgment about whether it is a flying saucer, whether it's reasonable, whether it's likely. And we do that on the basis of a lot more experience than whether it's just possible."

After all, Feynman noted, lots of things are possible. But most possible things don't actually happen. "It's impossible that everything that is possible is happening," he noted. "So most likely anything that you think of that is possible isn't true. In fact that's a general principle in physics theories: no matter what a guy thinks of, it's almost always false. So there have been five or ten theories that have been right in the history of physics, and those are the ones we want." Still, advocates of paranormal phenomena sometimes offer observations challenging the established rules of science. In those cases, Feynman observed, the observations may be somehow deficient. So another test of truth, he argued, is whether improving the quality of an observation increases the clarity of the supposed effect.

"If something is true, really so, if you continue observations and improve the effectiveness of the observations, the effects stand out more obviously," he said. "Not less obviously. That is, if there is something really there, and you can't see good because the glass is foggy, and you polish the glass and look clearer, then it's more obvious that it's there, not less." Alleged demonstrations of mental telepathy, he argued, fail that test. The more carefully such experiments are conducted, the smaller is the measurable telepathic effect. If improved experiments show a very small remaining effect, that probably means that the technique still isn't quite as good as it should be.

Another problem in assessing observations is the need to remember that relevant facts may remain unknown. Feynman offered a poignant anecdote about the death of his first wife. She died at 9:22 p.m., and her favorite clock, a gift from Feynman, had stopped at precisely that time. To some, it seemed a sign of the paranormal. But Feynman knew that the clock was old, with a digital face turned mechanically by wheels that tended to get stuck, especially when someone moved the clock. When Feynman's wife died, the nurse picked up the clock to check the time of death.

"So one must be careful in such anecdotes to remember all the conditions," said Feynman. "The ones that you don't notice may be the explanation of the mystery."

—Tom Siegfried

Tom Siegfried is science editor of the Dallas Morning News, *where this story originally appeared. Reprinted with permission of* The Dallas Morning News.

'Human Presence Detector' Device Fails Controlled Tests at National Laboratory

A double-blind test of an instrument that its manufacturer claimed could detect the presence of human beings at a distance through any material found no evidence that it could do so.

The results of the tests by Sandia National Laboratories in Albuquerque, New Mexico, showed that the DKL LifeGuard Model 2 "human presence detector" failed to meet its published specifications and its performance was no better than random chance.

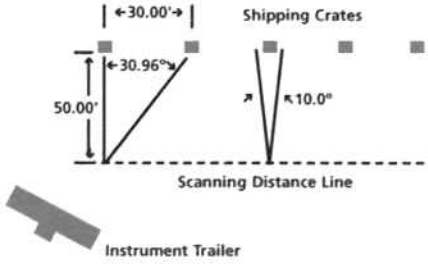
Sandia is a U.S. Department of Energy national laboratory with major research and development responsibilities in national security.

DOE's Office of Safeguards and Security asked Sandia to evaluate the performance of the DKL LifeGuard, from DielectroKinetic Laboratories, LLC. The company advertised that some models of the device could detect living human beings at distances of up to 500 meters through any material. (The model tested has a published range of twenty meters.)

Such a capability, if demonstrated, could be a tremendous help in search and rescue, law enforcement, and security. Word about the device had gained attention in government circles. Its list price ranges from $6,000 to $15,000, depending on the model.

The question posed to Sandia was simply: "Does this device work?"

Sandia researchers Dale W. Murray, Floyd W. Spencer, and Debra D.



Configuration of Sandia's test of the DKL LifeGuard "human presence detector."

Spencer designed a double-blind test to determine whether the device would perform as advertised. Murray is an electrical engineer in Sandia's Entry Control and Contraband Detection Technology Department. Floyd Spencer is a statistician. Debra Spencer is an analyst.

"It was not your usual test," Murray said of the DOE request. On the other hand, it was related to the responsibilities he has as project leader for Sandia's and DOE's entry-control project. "We work in the area of access control, and other departments in our center deal with intrusion-detection sensors," he said.

Murray said the device consisted essentially of a black rectangular box about three inches tall, one inch thick, and eight inches long. A handle pops out of the bottom so that the box swings freely. There's also an antenna, a little laser similar to a lecture pointer, and a red LED light. There were also some electronics inside.

A formal test protocol was first established. The Sandians then conducted the test March 20 in a remote area south of the laboratories. Five large plastic packing crates were set up in a line at 30-foot intervals. The goal was to see if the test operator, using the instrument, could detect in which of the five crates a human being was hiding. The operator was provided by the company and was a high-ranking member of DKL management.

The test was double-blind and random. Neither the instrument operator nor the three Sandia investigators would know which crate had the human test subject in it until after the results were tabulated. In fact, two of the three were not even present during the test.

The test set-up manager used a sealed, randomly generated test schedule to direct the test target (the human being) into one of the five containers. Using the device, the test operator would then attempt to determine which container he was in. He "scanned" the crates from a distance of fifty feet, well within its stated capabilities.

First, a baseline evaluation was done to see if the instrument was operating correctly. The test operator and the investigators were all allowed to see which container the human test subject entered.

Under this noncontrolled condition—when the instrument operator (and everyone else present) already knew which crate contained the human—he was quickly successful 10 times in 10 trials.

All subsequent tests were controlled. The test operator was not allowed to view which crate the test subject entered. Nor could the investigators. (They were confined inside a nearby instrument trailer during that time.) No one learned the full results until the entire set of testing was completed.

For each trial, one human test target was inside one of the five crates. The operator had a one in five probability of success by chance alone. Under these conditions, say the Sandians, the test operator began taking a much longer time to "scan" the crates.

This series of tests were spread over about 4.5 hours of total set up and test time. There were 6 successes in 25 trials.

A third series of tests was similar but a little more complicated. *Multiple* human targets could be randomly hidden in crates—but again with a probability for each crate of one in five. Once again the results were consistent with random chance.

The Sandians say the test operator offered a number of rationalizations for the difficulty of detecting the test subject and for the chance test results under controlled conditions. He said, for example, that the "sharp edges" of the crate were distorting the field and were interfering with the detection. However, the Sandia investigators point out that the manufacturer's published capabilities for the device include statements such as "penetrates all forms of camouflaging" and "no known countermeasures."

Although the empirical test was the core of the Sandia analysis, the Sandia team also briefly examined the DKL product literature about the supposed physics behind its operation. The product literature says that the instrument antenna detects the electrical field generated by the beating human heart, but the Sandia team found the idea put forth for that process "clearly wrong."

The Sandians also pointed out that the heart beats at a rate of 1.2 to 2.0 hertz and the wavelength of two hertz is 93,150 miles. "The 15-inch antenna on the LifeGuard is entirely inadequate for receiving signals of that wavelength," they reported.

"These points about the physics of the device support the conclusion of the results of the empirical tests," they said. "The device cannot perform any better than chance."

In early April the Sandia researchers wrote and submitted to DOE a 10-page report titled "Double-Blind Evaluation of the DKL LifeGuard Model 2."

The Sandians came to a clear conclusion:

"Our evaluation of the DKL LifeGuard, although brief, leads us to conclude that the device performs no better than random chance. Although we only had time to evaluate the device with one test operator, that test operator was from the DKL organization, was selected by the manufacturer to perform that evaluation, and spent considerable time trying to use the device to the best of his ability. Thus, we conclude that no other test operator would be able to establish a better performance of the instrument except by chance."

—Kendrick Frazier

continued on page 12

Fund for the Future

CSICOP AT THE CENTER FOR INQUIRY

An Unprecedented $20 Million Drive for the

Human beings have never understood the material universe as thoroughly as they do today. Yet never has popular hunger for superstition, pseudoscience, and the paranormal been so acute.

CSICOP and the *Skeptical Inquirer* are leading advocates for skepticism nationally and worldwide. But so much more must be done in the years to come.

Day and night, the Center for Inquiry has become a focus of academic and popular inquiry.

Publishing revenues alone cannot fund the bold outreach today's challenges demand. Hence the Fund for the Future Campaign, a ten-year effort to add 20 million dollars to the Center for Inquiry endowments.* Gifts and endowment income will fund projects including:

Council for Media Integrity

Formed just weeks after its inclusion in the Ten-Year Plan, the Council for Media Integrity will monitor and rebut media programs that convey unfounded claims and mislead the public about science. Members include Steve Allen (chair), Stephen Jay Gould, and many others. CSICOP will invest in electronic infrastructure to facilitate rapid response to irresponsible programs.

Adult Education

The Council cosponsors the Center for Inquiry Institute, which has already expanded its offerings to include a new three-year certificate program in science and skepticism. Sessions are scheduled in Amherst and Los Angeles.

Enhancing Library Resources

The Center for Inquiry's skeptics' library—already the finest of its kind in the world—needs expanded funding to enlarge its core collection and add electronic media. Worldwide modem access to the library's catalog is already nearly complete.

*Combined endowment goal of CSICOP and the Council for Secular Humanism, both nonprofit tax-exempt educational organizations.

Steve Allen
Honorary Co-chair

Martin Gardner
Honorary Co-chair

Future of Science and Reason

The New Ten-Year Plan

To continue its leadership in the defense of reason, CSICOP has articulated a Ten-Year Plan designed to:

- *Promote science and reason*
- *Develop public support and participation*
- *Develop The Center for Inquiry as an education and research center*
- *Build up the Committee's resources*

The Center for Inquiry attracts global media attention with scholarly conferences and events like this public "Friday the 13th Superstition Bash."

For the Young

To present skeptics' message more compellingly to the young, CSICOP will develop new materials—ranging from age-appropriate print publications to audio and video cassettes and instructional courseware. Goals include enhanced understanding of science and improved critical thinking skills.

Regional Outreach

With the establishment of The Center for Inquiry - West (Los Angeles), The Center for Inquiry - Midwest (Kansas City) and The Center for Inquiry - Rockies (Boulder, Colorado), giant steps have been taken to enhance direct field service to skeptical activists. Additional regional Centers are planned with expanded calendars of activities.

How Can I Help?

The Center for Inquiry Fund for the Future depends on generous support from each of our readers and friends. Gifts of cash, securities, and other assets are sought. A three-year pledge can make more substantial gifts surprisingly affordable. Many forms of planned giving arrangements can be arranged. All requests will be held in confidence.

Only financial support from skeptics and other friends of science can place the skeptical movement on a firm financial foundation.

At the first World Skeptics Congress in Amherst, New York, participants gave or pledged an unprecedented $201,000 to give the Fund for the Future campaign a vigorous start.

We invite you to make your commitment to the Fund for the Future today. For more information, complete and mail the postpaid reply card.

CSICOP
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Frederick 'Rama' Lenz Dies on Easter Sunday

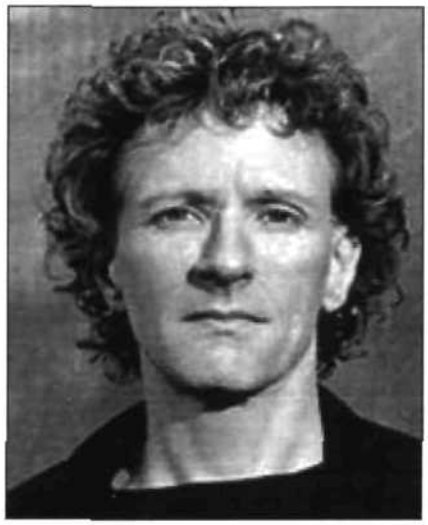
On April 14, 1998, headlines in the New York area papers announced that Frederick Lenz, the controversial guru known as Rama, was dead. His body was pulled by police from Conscience Bay in twenty feet of water behind his mansion on Long Island. Lenz apparently died on Easter Sunday after allegedly taking "150 phenobarbital tablets."

Police found an incoherent woman identified by police as model "Brin Lacy," 33, of Manhattan, inside the $2 million mansion soon after midnight on April 13. Lacy reportedly said she saw Lenz fall in the bay and float away on his back on Easter morning while they were out on a floating pier sixty feet from shore. The model was reported as "being all bruised up" when the police found her. Toxicology reports could take as long as two months. Lenz's three terriers were also drugged, according to the *New York Post* report on April 16.

I learned from a reliable source that Lenz was suffering from painful liver cancer, which may account for his use of "pain pills." There are some strange parallels to the Heaven's Gate mass suicide last year: The leader, Marshall Applewhite, also overdosed on barbiturates around Easter Sunday, and he also suffered from cancer.

In 1983 Frederick Lenz III declared to his devotees that he was "Rama," an incarnation of a Hindu deity. For the decade prior to that Lenz had been Atmananda, his name as a recruiter for the controversial Indian guru, Sri Chinmoy. Lenz broke with Chinmoy to start his own cult in the early eighties—a group then called Lakshmi after the Hindu goddess of wealth. By design nearly all of Lenz's "students" entered the computer programming field and nearly all of them were young, bright seekers with a college education.

Lenz attracted national attention in the mid-eighties through slick full-page ads promoting his "free" seminars in New Age magazines. He claimed to be



Frederick Lenz

one of "twelve" enlightened beings living then. The number shrunk to three or four by the early nineties, but he would not name the others. As many as a thousand would attend to learn his idiosyncratic brand of Zen Buddhism.

Controversy soon attended him as former students complained of mind control, sex, and drug abuse when the guru offered them private sessions. National media criticism from *Newsweek, A Current Affair, New Age Journal* and many other sources in the late eighties caused Lenz to become more reclusive and paranoid. Lenz also upped the "tuition" for full-time students to thousands of dollars a month by the late eighties. Many dozens paid that and more to afford Lenz a lavish lifestyle. His devoted students believed that Rama was their psychic protector as well as the reason they were making money—he encouraged them to believe they owed it to him.

Lenz wrote and published several books, including an early one on reincarnation that he dedicated to Sri Chinmoy. Lately, he was known for two autobiographic fantasies, *Surfing the Himalayas* (1995) and *Snowboarding to Nirvana* (1997), both published by St. Martin's Press. (I reviewed both novels for SKEPTICAL INQUIRER). At this writing it is unknown what his devotees might do; they have been silent for weeks. Some experts fear that members will contemplate suicide. *Dateline NBC* ran an in-depth exposé of Lenz as a "cult leader" in August of 1996. The show indicated how deeply Lenz influenced the hopes and dreams of his devotees.

A website for Rama's students, http://www.ramalila.com, indicates that members are sharing their grief and praise for Rama. This is a good sign for those who feared ensuing "devoteecides." His group will go on in some fashion.

—Joe Szimhart

Joe Szimhart, of Pottstown, Pennsylvania, is a cult specialist and exit counselor who has, since 1987, helped nearly two dozen former Lenz devotees recover from their experience.

Pigs Might Fly! Here Are Randi's 1998 Pigasus Awards

The indefatigable conjurer/investigator James Randi has issued his 1998 Pigasus awards. These awards are given out every April 1 by the James Randi Educational Foundation. The characterizations below are Randi's.

This year's winners are: Category #1, to the scientist who said or did the silliest thing related to the supernatural, paranormal, or occult, goes to Dr. Michael Guillen of ABC-TV News. The science editor of ABC-TV's *Good Morning America* since 1988, Guillen has supported all manner of questionable "New Age" notions, usually by featuring endorsements by celebrities. Guillen holds a Ph.D. degree in physics, mathematics, and astronomy. [See the exchange between Michael Guillen and Robert Park in the May/June 1998 *SI*, p. 67. — Ed.]

Category #2, to the funding organization that supported the most useless study of a supernatural, paranormal, or occult claim, goes to the National

Institutes of Health, whose budget for their Office of Alternative Healing began as two million dollars, and now amounts to twenty million. This money, originally marked to do " basic research" on alternative healing claims such as homeopathy, acupuncture, and chiropractic, has been dribbled away on peripheral claims of individual quack advocates.

Category #3, to the media outlet that reported as fact the most outrageous supernatural, paranormal, or occult claim, the prize goes to ABC-TV News, for their unquestioning and enthusiastic endorsement of "cold fusion," ESP, psychokinesis, astrology, "magnetic therapy," and all sorts of junk science and highly questionable "alternative healing" modalities.

Category #4, to the "psychic" performer who fooled the greatest number of people with the least talent, is given this year to all the psychics, astrologers, fortune tellers, spiritualists, and palm readers who, though they were consulted a matter of hours before her death, all failed to see any danger for Princess Di. These were the best of the best, highly paid and respected by Di and her friends.

Tai Chi Master's 'Empty Force' Proves To Be No Shield

Shen Hongxun is a Tai Chi teacher who claims to have mastered, and to be able to exhibit, the Empty Force (and other 'special forces'). The Empty Force supposedly enables a practitioner to hurl people to the ground without touching them. Dr. Shen offers week-long seminars (tuition fee £300) for those wishing to acquire these skills.

Following such a course held in Newport in Britain in 1995, an attendee, Paul Brewer, wrote a report for issue 5 of the *Tai Chi Chaun* journal extolling Shen's demonstrations of his powers.

Issue 6 of the journal contained two skeptical letters in response. One from a highly respected Tai Chi teacher, Dan Docherty (a very amusing letter), and one from Rob Morton.

Issue 8 contained a rebuttal from Shen, and featured three photographs (shades of levitating TM-ers!) showing an adult male falling to the floor and rolling out of a room, propelled by the waving hands of Shen. It also published a letter from Brewer, challenging Docherty and Morton to put their money where their pens were, inviting them to attend the next seminar, and promising to refund their tuition fees if they did not become convinced of Shen's special powers.

Docherty and Morton duly attended. On the first day, before the seminar commenced, Docherty brandished his £300 and stated that he was happy to pay, but wished first to have a demonstration of the powers. He told Shen, both in Mandarin Chinese and in English (to avoid any confusion), what he was about to do. He slowly approached Shen, gave him time to summon/prepare/deploy his special powers, and proceeded to pour a liter of water over him. Needless to say, Docherty did not collapse and roll out on the room, the water did not take detour around Dr. Shen's head, nor did it spontaneously leap into the jug. Thereupon Docherty and Morton left the seminar.

I have summarized it here, and details

APS Worries about Nonsense in Name of Science

Cold Fusion Transforms Again

The following two items are from Robert Park's American Physical Society "What's News" electronic newsletter for April 17, 1998

• APS Council: Concern over growing influence of nonsense

The elected Council of the American Physical Society, meeting in Columbus, Ohio, asked the Panel on Public Affairs to prepare a statement, written in language that can be readily understood by the general public, of what science is, and what distinguishes it from other human activities. It is to be shared with other scientific organizations developing a response to the alarming spread of nonsense calling itself science. The Council discussion made it clear how difficult it will be to agree on such a statement—and how important as well. It is a debate that should involve everyone who loves science.

• Cold Fusion-7: Vancouver meeting reports more than heat

The preferred term among believers is now "chemically-assisted nuclear reactions." Nowadays it seems to transmute gold into base metals, neutralizes radioactivity, and works fine with ordinary water. We note that the probability of N miracles is equal to the probability of one miracle to the Nth power.

• Robert L. Park has received the American Physical Society's 1998 Joseph A. Burton Forum Award. The award citation praises Park for "'telling it like it is' with his widely read "What's New" [APS's weekly electronic newsletter, example above] and through other means on physics-related aspects of science and public policy issues." Park is a professor in the physics department at the University of Maryland and APS's director of public information.

—K. F.

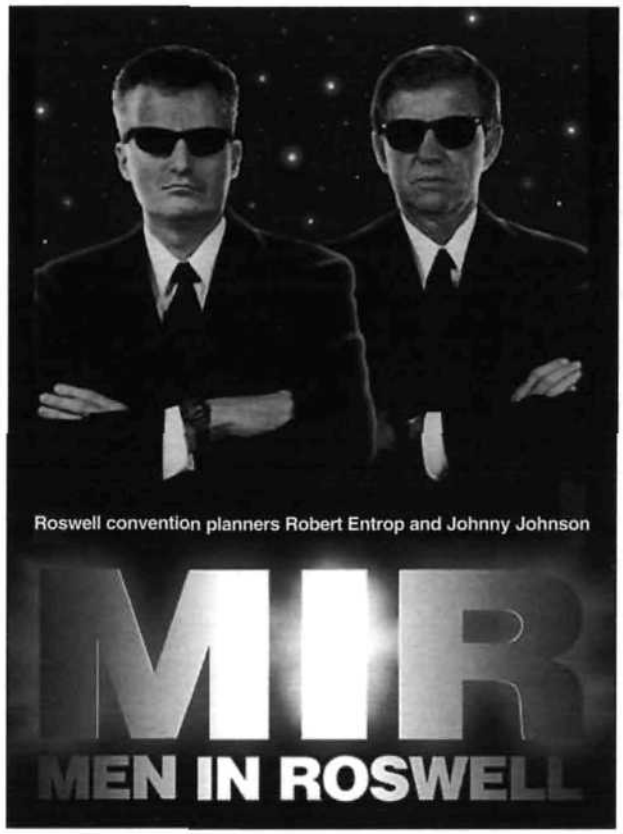
to the above can—at this writing anyway—be found on the World Wide Web. Visit www.taichichuan.co.uk/wudang—it featured a video still showing Shen physically attempting to fend off the water. Rob Morton appears to be aware both of CSICOP and of Randi's challenges.

There is a lot more detail, and I have access to the Tai Chi journals plus a pamphlet about Dr. Shen's teachings. (Sample quote: "The Qigong master commands the ability to see the past and into the future. This ability is used to track down criminals.")

—Fraser Dingwall

Fraser Dingwall reports from South Sea, Hampshire, U.K.

Saucer Shorts



Roswell convention planners Robert Entrop and Johnny Johnson

Courtesy Roswell Convention and Visitors Bureau

■ Roswell, New Mexico, is ecstatic over the recent boost in economic development from 1997's 50th anniversary of the Roswell incident celebration. Some 1,009 articles were written about the event in 430 publications with a total circulation of 46,160,000, a publicity windfall worth $4.45 million in advertising had they paid for it. "No one can buy that kind of publicity," says Johnny Johnson, director of the Roswell Convention and Visitors Bureau. Two hundred new motel rooms are being built. To try to capitalize further, the bureau has widely disseminated a tongue-in-check "Men in Black" advertisement about Roswell (above) showing Johnson (on the right) and colleague Robert Entrop. It's running in tourism, business, and other magazines around the country.

■ Aztec, New Mexico, doesn't want to be left out. Realizing that there is money in attracting the UFO faithful, this northwestern New Mexico town organized the "UFO Crash at Aztec 50th Anniversary Event" for May 25, 1998. It commemorates a story (even more dubious than Roswell) that a flying saucer with sixteen aliens on board crashed twelve miles northeast of Aztec in 1948. Few people know about this mysterious event nor even how the story got started, but that's not stopping Al Guilford, president of the Aztec library's board of directors, from publicizing the anniversary on behalf of the library. Not even the date of this supposed "crash" is clear. One UFO book says March 24, 1948, but its cover leaf gives it as May 24, 1948. Says Aztec librarian Leanne Hathcock, "We're saying May 25 because it works for us." Says the owner of Aztec's biggest motel (thirty-nine rooms): "The UFO thing may or may not have happened, but who cares. Anything we can do to promote our community excites me."

■ U.S. Rep. Steve Schiff died March 25, 1998, of an aggressive form of skin cancer, which he had been battling for more than a year. The five-term New Mexico Republican was respected by his constituents for his low-key, straightforward style, but he gained fame in UFO circles and notoriety among skeptics for calling for a General Accounting Office (GAO) investigation of claims of a government coverup of events surrounding the 1947 Roswell crashed-saucer stories. Then when the GAO failed to find any evidence of a crashed saucer Schiff's office released the report with a news release downplaying that central conclusion and saying important documents from that period were missing. Nevertheless, Schiff's request did lead to a new Air Force investigation of the Roswell incident and its two reports fully explaining the events without resort to a crashed saucer.

—Kendrick Frazier

CSICOP Compiles Top Ten Paranormal Hoaxes

The word hoax is thought to be a shortening of "hocus-pocus"—a synonym for trickery. Essentially a hoax is an imposition on the victim's credulity. It may range from harmless mischief, such as that associated with April Fool's Day, or it may have a more cruel or sinister aspect.

Superstition and paranormal belief have always been a part of human nature. Trickery and deception have often played upon the public's weaknesses and will to believe. Although hoaxes and intentional deception are rampant in paranormal claims, Joe Nickell and Matt Nisbett of CSICOP have picked the top ten enduring paranormal hoaxes.

1. Roswell Incident

In 1947 a "flying disc" crashed near Roswell, New Mexico. A rancher

described the debris as foil paper, sticks, string, and tape consistent with a radar reflector, once thought part of a weather balloon but now identified as a government spy balloon. Over time the story has prompted many hoaxes, including forged papers which supposedly proved presidential involvement in a cover-up, tales of aliens stored at secret installations, and an "alien autopsy" featuring a rubbery humanoid. (See SKEPTICAL INQUIRER, Winter 1990 and Nov/Dec 1995)

2. Spiritualism

Modern spiritualism began in 1848 when two girls apparently received messages from a ghost who responded to their questions by knocking a certain number of times to signal simple answers. Soon assisted by an older sister, the girls traveled all over the United States to promote their "Spiritualist" society. Four decades later, however, the sisters revealed to a theater audience how they had secretly produced the rapping sounds. (SKEPTICAL INQUIRER, Winter 1983–1984 and Fall 1985)

3. Psychic Phone Networks

Science has failed to validate psychic ability; yet by using shrewd methods and aggressive marketing pitches, modern phone psychics are able to appear clairvoyant. Ironically, the billion-dollar industry's pioneer network, Psychic Friends, recently filed for bankruptcy—an event that 2000 psychics employed by the network failed to foresee. (SKEPTICAL INQUIRER, Sept/Oct 1995)

4. Shroud of Turin

Perhaps the world's most notorious religious hoax is the purported Holy Shroud of Jesus, which bears the imprints of an apparently crucified man. Modern forensic tests, however, show the image was done in tempera paint, and radio carbon testing yielded a date between 1260 and 1390 CE. This is consistent with a bishop's report that an artist confessed he had "cunningly painted" the image. (SKEPTICAL INQUIRER, Spring 1982 and Spring 1989)

5. Cottingley Fairies

In 1917 two English schoolgirls launched a deception that fooled many people over the following years, including the creator of Sherlock Holmes, Sir Arthur Conan Doyle. The girls took close-up photographs of winged fairies dancing in Cottingley Glen. Photo experts said the images were not double exposures nor had the negatives been altered. In fact, it was the *scene* that was faked: the girls had simply posed with fairy cutouts. (SKEPTICAL INQUIRER, Summer 1983)

6. Crop Circles

Since the late 1970s, mysterious swirled patterns have been appearing in southern English grain fields. Some thought the depressions were caused by "wind vortexes," while others offered a mystical or extraterrestrial explanation. However, in 1991 two men demonstrated how they had made the first circles, which others copied and elaborated. (SKEPTICAL INQUIRER, Winter 1992)

7. Amityville Horror

America's most famous haunted house is located in Amityville, New York, where in 1974 a man murdered his parents and siblings. A year later the house was bought by a couple who soon claimed they were driven out by spooky events. But investigation showed the events never transpired, and the murderer's lawyer confessed how, for money, he and the couple had "created this horror story over many bottles of wine." (SKEPTICAL INQUIRER, Winter 1979–1980)

8. Piltdown "Missing Link"

In December 1912, the long-sought-after "missing link" between man and his prehistoric ancestors was reportedly recovered near Piltdown Common in England by an amateur fossil collector. To world-wide acclaim, the bones were soon enshrined in the British Museum. In 1953, however, the find was revealed to be a combination of ordinary human cranial pieces and the jawbone of an orangutan. (SKEPTICAL INQUIRER, Spring 1980)

9. Psychic Surgery

Among the most outrageous—and dangerous—hoaxes is a phony healing procedure in which a practitioner appears to reach into a patient's body, without benefit of scalpel or anesthesia, to remove "tumors" and other diseased tissue. Common to Brazil and the Philippines, psychic surgery is actually produced by sleight of hand with animal tissue and blood being used to give a realistic appearance. (SKEPTICAL INQUIRER, Spring 1980)

10. King Tut's Curse

The "boy king" Tutankhamen ruled Egypt from the age of nine until his death at eighteen, during the twelfth century B.C. His tomb was discovered in 1922, but a curse written over the entrance began to take its toll, resulting in the death over the years of many associated with the excavation. Or so it was claimed. In 1980 the tomb's former security officer admitted the story of the curse had been circulated to frighten away thieves. (SKEPTICAL INQUIRER, Summer 1982)

* * *

Unfortunately, with the exception of the Piltdown case, people worldwide continue to be fooled by these hoaxes. Too often the explanations or criticisms of these fabricated claims go unheard in the international media, while movie makers, television producers and book publishers draw on these hoaxes to weave top-grossing fiction that is often treated as real. Until the media provide more critical presentations of the paranormal, a word of warning is the only known antidote.

Joe Nickell is investigative columnist for SKEPTICAL INQUIRER. Matt Nisbet is Public Relations Director for CSICOP. ☐

Near-Earth Objects:
Monsters of Doom?

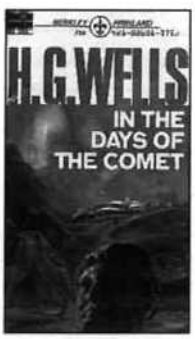
Asteroid! Asteroid!
Speeding through the sky.
Will it strike or graze the earth?
Will everybody die?

— Armand T. Ringer

Last March astronomer Brian Marsden, at the Harvard-Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, issued a spine-chilling announcement. Based on eighty-eight days of observing asteroid 1977 XF11, his computer calculated that this massive rock would come perilously close to Earth at 1:30 P.M. Eastern time, on Thursday, October 26, 2028. It could miss Earth by a mere 30,000 miles, only about one-eighth our distance from the moon. Almost a mile wide, if the rock struck the earth the devastation would be too awful to contemplate.

The next day, before fundamentalist cult leaders had time to integrate this possible cataclysm into their Second Coming prophecies, Marsden was humbly apologizing. Eleanor Helin and her associates at NASA's Jet Propulsion Laboratory located a seven-year-old photo of XF11 that permitted a more precise calculation of its path. The asteroid circles the sun every twenty-one months. On its 2028 crossing of Earth's orbit it will miss us by 600,000 miles, about two-and-a-half times the moon's average distance from Earth.

"Near-Earth Objects" (NEOs) is today's term for massive objects that periodically cross Earth's orbit not far from our planet. They include asteroids, meteoroids that are mostly asteroid fragments resulting from collisions, and comets which come from regions far beyond Pluto. Disasters caused by NEOs striking Earth were common themes in early science fiction as well as in some modern disaster movies.



As usual, H. G. Wells pioneered the theme.[1] His novel *In the Days of the Comet* concerns the effects on Earth of a near miss by a giant comet. His short story "The Star" is a vivid account of devastation caused by a mammoth NEO. An asteroid (Wells calls it a "planet") from the outskirts of the solar system is shifted from its orbit. It collides with Neptune. The two coalesce to form a flaming "star" that almost demolishes the Earth before it plunges into the sun.

Wells's story first ran in the 1887 Christmas issue of the London periodical *The Graphic*. I have framed in my study the magazine's full-page, full-color illustration showing Londoners staring upward at the star and shouting "It is brighter!" A newsboy holds a paper with a headline, "Total Destruction of the Earth," in huge scarlet letters.

Here is how Wells describes what happens as Earth and star swing around each other:

> And then the clouds gathered, blotting out the vision of the sky, the thunder and lightning wove a garment round the world; all over the earth was such a downpour of rain as men had never before seen, and where the volcanoes flared red against the cloud canopy there descended torrents of mud. Everywhere the waters were pouring off the land, leaving mud-silted ruins, and the earth littered like a storm-worn beach with all that had floated, and the dead bodies of the men and brutes, its children. For days the water streamed off the land, sweeping away soil and trees and houses in the way, and piling huge dykes and scooping out Titanic gullies over the countryside. Those were the days of darkness that followed the star and the heat. All through them, and for many weeks and months, the earthquakes continued.

I still recall as a boy reading in Hugo Gernsback's *Science and Invention*, then my favorite magazine, the six installments of a preposterous novel that ran in issues July through December 1923. The author was Ray Cummings, and his novel was titled *Around the Universe: An*

Martin Gardner's latest book is The Last Recreations *(Springer-Verlag, Copernicus, 1997), a collection of twenty-three of his* Scientific American *columns from the last seven years before his retirement from the magazine in 1981.*

Astronomical Comedy. It was about a spaceship that carried Tubby, his girlfriend, and an astrophysicist called Sir Isaac. After exploring the universe, they learn that evil Martians are planning to invade the earth. To prevent this, Sir Isaac steers his spaceship in circles around a tiny asteroid, causing it to shift its orbit slightly. This results in a series of collisions with larger asteroids, all precisely calculated by Sir Isaac, that finally create a giant fireball which collides with Mars and obliterates its inhabitants.

This is not as crazy as it seems. The orbits of asteroids are chaotic. A minute change in one orbit could start a "butterfly effect" of the sort triggered by Sir Isaac. Even our solar system is unstable. A giant NEO coming close to a small planet or striking it could set off a chain reaction that could conceivably kick a planet out of the solar system. (See "Crack in the Clockwork," by Adam Frank, in *Astronomy,* May 1998, pp. 54-59.) Newton was well aware of this instability. He believed it was necessary for God to intervene at times to readjust planetary orbits to keep the system running smoothly.

Later science-fiction novels about NEOs that wreck Earth are far too numerous to list. On the movie screen New York City has twice been destroyed by NEOs. It was demolished in a dreary 1979 film, *Meteor,* which wasted the talents of Sean Connery, Natalie Wood, Henry Fonda, and Trevor Howard. In an earlier and even more absurd film, *When Worlds Collide* (1951), a wandering star called Ballus flattens New York City with a gigantic tidal wave. The recent XF11 scare has been great publicity for two new disaster films about NEO impacts released this year just after the time I am now writing: Disney's *Armageddon,* starring Bruce Willis and Paramount's *Deep Impact* featuring Robert Duvall. It's a good bet that the visual effects of both films will be superior to their scientific accuracy.

When Worlds Collide was based on a popular 1933 novel by Philip Wylie and Edwin Balmer. In the book the doomsday NEO is called Bronson Alpha—a huge planet around which a small earthlike planet (Beta) whirls. The pair have broken away from a far distant sun system. Beta once supported a culture of sentient beings, and the cold of outer space has, of course, frozen everything on its surface.

Terrified motorists watch as a comet approches in *Deep Impact.* ©1998 Paramount Pictures

Alpha's close brush with Earth destroys its cities with violent tidal waves, earthquakes, and volcanic eruptions. As the authors put it: "The Earth burst open like a ripe grape." There are survivors. The planets loop around the sun, then return to Earth. After destroying the moon, Alpha collides with Earth, reducing it to fragments. Alpha then leaves the solar system on a hyperbolic path.

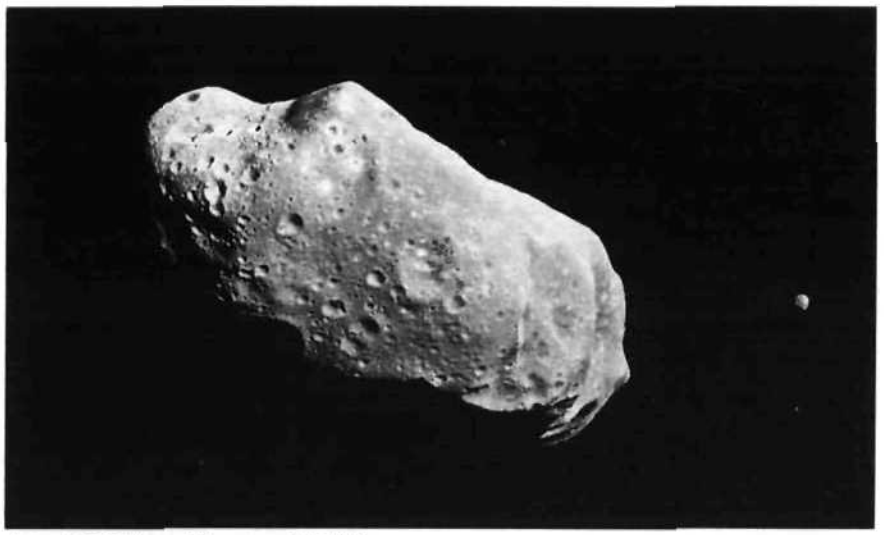
Beta remains to replace Earth as a permanent member of the sun's system. Just before Earth vanishes, a group of several hundred brave men, women, and children manage to escape in two atomic-powered spaceships. They land on Beta where they find a warmed-up planet with an emerald sky, surviving plants, and a breathable atmosphere almost identical to Earth's. They will colonize the planet and preserve humanity. Lovers Tony and Eve provide the book's romantic interest.

When the novel began serialization in *Blue Book* magazine in 1932 it was an instant sensation among SF buffs. One critic called it "an astronomical fantasy of the first magnitude." The hardcover became a best-seller. In my opinion it is low-level pulp fiction with little hard science to redeem it.

The sequel, *After Worlds Collide,* which began in *Blue Book* in 1933 and was published as a book the following year, is even worse. The colonizers find plastic-covered cities on the planet, metal roads, curious airships, and a vast electric power station. There is no trace of inhabitants. Paintings show the denizens to be humanoid. Other earthlings have also escaped in spaceships to Beta. A war breaks out between the Americans and a group of Asiatic Communists. The Americans win. A great mystery remains. What happened to Beta's humanoids? A second sequel was contemplated to answer the question, but Balmer and Wylie failed to agree on the plot and it was never written.

Later science-fiction authors have been less concerned with NEO collisions than with adventurers who mine the asteroids for iron, nickel, and more valuable minerals. Examples are Clifford Simak's story "The Asteroid of Gold," and Malcolm Jameson's "Prospectors of Space." Other tales involve asteroids that are disguised as spaceships, or being used as stop-over spots for explorers on their way to more distant reaches of the solar system.

"Asteroid" is Greek for "starlike." They were named that because early telescopes could see them only as points of light. Two large asteroids have since been photographed up close by space probes. They resemble misshapen potatoes, their



Asteroid 243 Ida and its moon. NASA/JPL

surfaces pockmarked with craters like the surface of our moon.

The asteroid belt, between the orbits of Mars and Jupiter, contains tens of thousands of asteroids with diameters of a mile or more. The larger ones are spherical, but smaller ones, their cohesion greater than their gravity, are extremely irregular. There is no lower limit to asteroid size because they grade down to tiny rocks and particles of dust. None is big enough to hold an atmosphere.

Ceres, the largest asteroid and the first to be discovered (in 1801) is more than 600 miles across. A year later Pallas, about 370 miles wide, was found. Juno, about 140 miles across, and Vesta, with a diameter of possibly 330 miles, were found in 1804 and 1807 respectively. Because of its surface's high reflectivity, Vesta can at times be seen by unaided eyes. The four asteroids combined account for more than half the total mass of all the asteroids. Altogether they would make a planet smaller than our moon.

Ida, the second asteroid to be photographed close up (Gaspara was the first), is about thirty-six miles long. To the amazement of astronomers, the photo revealed a tiny moon orbiting Ida, possibly a piece chipped off the asteroid. Several other asteroids are believed to have a moon. Next year a probe called "Near Earth Asteroid Rendezvous" will be snapping close up pictures of Eros, the largest of the NEOs, which crosses Earth's orbit every forty-four years.

Asteroids were once thought to pose a grave hazard to space flight, but it turned out that distances between those large enough to damage a spaceship are so vast—typically millions of miles—that the danger of such accidents is near zero. Fatal collisions of spaceships with asteroids were common in early space operas before the asteroid belt was found to be much cleaner than previously suspected.

For a while the asteroids were named after Greek gods (at first, only females), but when such names ran out, they began to be named for cities, states, nations, persons (real and fictional), and even pets. Whoever found a new asteroid was usually allowed to name it. Today, most asteroids are designated by the year of discovery followed by letters and maybe a number. I am pleased to report that James Randi and I have asteroids named for us. CSICOP and its founder Paul Kurtz both had asteroids named for them on CSICOP's twentieth anniversary (*SI* September/October 1996, p.8).

What produced the asteroids? In Conan Doyle's novel *The Valley of Fear* we learn that Sherlock Holmes's bitter enemy, Professor Moriarty, wrote a treatise titled "The Dynamics of an Asteroid." Isaac Asimov once conjectured that this obscure paper argued that asteroids are remnants of a small planet whose inhabitants discovered nuclear energy and blew their world to smithereens. This notion, once a favorite of science-fiction writers, has been abandoned on the grounds that not even a nuclear explosion would be great enough to form the asteroid belt. The prevailing view is that the rocks are material that failed to coagulate into a planet, perhaps because of the strong gravitational influence of nearby Jupiter.

There is no doubt that eventually Earth will be struck by a massive NEO because such events have often occurred in the past. The most recent was the 1908 crash of a large NEO in the Tunguska River valley of Central Siberia. It flattened trees for many miles around and killed a herd of reindeer. Earth is spotted with dozens of visible craters that testify to similar impacts, and there surely are thousands of craters that vanished long ago from erosion. It is widely believed that the impact of a giant NEO caused a mass extinction of life, including the dinosaurs, 65 million years ago at the end of the Cretaceous era.

Almost all asteroids are confined to the asteroid belt, but many wander far beyond the orbit of Jupiter, and others plunge inward past the orbit of Venus. One called Icarus swings inside Mercury's orbit, and Charon floats beyond Saturn. The two moons of Mars may be captured asteroids. It is estimated that more than a thousand asteroids at least a mile wide are NEOs. Perhaps a dozen are three or more miles wide. They pose a monstrous threat to humanity if they come close to Earth or hit it.

In 1937 Hermes, half a mile wide, missed us by about twice the distance from Earth to the moon. In 1989 an asteroid called Asclepius, also about half a mile across, came even closer. In 1991 a small asteroid about thirty feet wide missed the earth by less than half the distance to the moon. The latest near miss was in 1996 when JA1, a third of a mile wide, set a record for large asteroids by missing us by a mere 280,000 miles, only 40 thousand miles longer than the earth-moon distance.

If some time in the future an asteroid is determined to be on a near collision with Earth, what can be done to prevent disaster? One suggestion, not overlooked in science fiction, is to attach a nuclear bomb to the rock that will blow it into a harmless orbit. (Early science

fiction used cannonballs to deflect comets.) The danger of this is that it could produce fragments that would hit the earth, causing even more damage than the intact rock.

This is exactly what happens in *Asteroid*, a four-hour 1977 television film which NBC aired again last March. A comet alters the orbits of a group of asteroids and sends them hurtling toward Earth. The largest, Eros, is exploded with laser beams, but the thousands of resulting fragments are large boulders that rain down on earth to cause unspeakable devastation. The film's visual effects are riveting, especially the leveling of Dallas skyscrapers, but the search for survivors and the rescue scenes seem interminable. Better techniques for diverting an asteroid may be landing a rocket engine on the rock to nudge it into a harmless trajectory, or attaching a large solar sail to let the sun's radiation do the nudging.

Suppose, however, there is not enough time for measures to be taken to prevent a collision, and Earth is shattered by a giant NEO that will hurl us all into oblivion. What are the philosophical implications of such an event? This obviously is not a problem for atheists, agnostics, or pantheists because they are resigned to the fact that Nature does not care a rap about preserving a species.

What about theists? I'm inclined to think that even to them a sudden extinction of humanity would be acceptable. The Biblical Jehovah, remember, is said to have drowned every man, woman, baby, and their pets, except for Noah and his family.

If God can allow an earthquake to kill thousands, or the Black Death to wipe out half of Europe, surely she would have no scruples about allowing an asteroid to bring human history to a flaming end.

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On the miscalculation of XF11, see "Whew!" by Leon Jaroff, in *Time;* "Never Mind!" by Adam Rogers and Sharon Begley, in *Newsweek;* and "Okay, So They Were a Little Off," by Charles Petit, in *U.S.News and World Report.* All three articles were in March 23 issues.

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Note

1. This is not strictly true. There were a few earlier but undistinguished stories about Earth's encounter with NEOs; for example, Edgar Allan Poe's "The Conversation of Eiros and Charmian" (1839). Two former earthlings, now disembodied spirits, recall the Earth's destruction by a giant comet. It withdrew from Earth's atmosphere all its nitrogen. The remaining oxygen caused the earth to explode in flames. Everett Bleiler's *Science Fiction: The Early Years*, (1990) lists "The Comet," a story by S. Austin, Jr., also published in 1839, in which the Earth is destroyed by a comet. □

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CFI founder Paul Kurtz addresses a recent meeting in Southern California.

Science vs. 'Shroud Science'

In what *Time* magazine called a "sort of resurrection," the Shroud of Turin controversy has risen once again. It was sparked by the reputed burial cloth's exhibition during April and May in Turin, Italy, the first public showing in two decades. It also marked the one-hundredth anniversary of the first photograph of the cloth's image—that of a man who appears to have been crucified like Jesus in the Christian gospels (Van Biema 1998).

Miraculous "Photograph"

The 1898 photographer's glass-plate *negatives* revealed a startlingly realistic *positive* image, with the prominences in highlight and the recesses in shadow. Therefore the image on the cloth, shroud advocates claimed, was "a perfect photographic negative." They insisted no artist could have painted such an image before the concept of photography. (Actually the image is only a quasi-negative, the hair and beard being the opposite of the features and giving the effect, when a positive is made, that Jesus was a white-bearded old man. See Figure 1.)

With the photographs began the modern era of the shroud, prompting attempts to explain the image. Simple contact imprinting was soon ruled out due to the image's lack of wraparound distortions, and a concept called "vaporography" was disproved when the postulated vapors were shown to produce only a blur. In time "the first Polaroid in Palestine" was ascribed by proponents to "flash photolysis," a "theory" that the image was produced by a miraculous burst of radiant energy at the time of Jesus' resurrection (Nickell 1988).

"Shroud Science"

With such notions came an unfortunate abuse of science. Whereas the scientific approach is to let the evidence lead to a solution, "shroud science" (or "sindonology") begins with the desired answer and then works backward, dismissing or rationalizing whatever arguments or evidence may be incompatible with it. It was therefore difficult to imagine that it was scientists who were so readily invoking a miracle. Unfortunately, the forty-some-member Shroud of Turin Research Project (STURP), which conducted the 1978 investigation of the shroud, was woefully unqualified for the task. Many members were operating out of their specific fields, and bad—certainly questionable—science was rampant. That situation continues in sindonology today.

The 1998 exposition was shrewdly timed to begin a week after Easter, and media coverage before and during the religious season was intense. In addition to a spate of new books, including Ian Wilson's *The Blood and the Shroud,* there was a flurry of newspaper and magazine articles as well as TV news segments. Alas, shroud science was well served by shroud journalism, whereby reporters' questions about authenticity were directed primarily to shroud proponents—rather like asking members of the Flat Earth Society about the curvature of the earth.

Perhaps the most used word during the shroud media blitz was "mystery." But honest journalists don't engage in mystery mongering. Instead, like all true investigators, they believe mysteries are meant to be carefully and fairly examined. In the case of the Shroud of Turin, the question of authenticity was long ago settled.

The Historical Record

To begin at the beginning, the Shroud of Turin contradicts the Gospel of John, which describes multiple cloths for Jesus's burial, including a separate "napkin" over the face, as well as "an hundred pound weight" of spices—not a trace of which appears on the Turin cloth. And nowhere in the New Testament is there mention of a remarkable portrait of Jesus having been left on his burial garment. In addition, no examples of the

Joe Nickell is author of Inquest on the Shroud of Turin, *originally published in 1983, soon to be reissued by Prometheus Books.*

Shroud's particular herringbone twill weave date from the first century.

Although Jesus's body would have been ritually washed, as mandated by the Jewish Mishnah, the "body" imaged on the shroud was not cleansed (as shown by the dried blood on the arms). Some sindonologists attempt to circumvent the problem by citing a passage from the Code of Jewish law, but the supposed exception dates from some fifteen centuries after Christ and poorly applies to one who was buried "as the manner of the Jews is to bury" (John 19:40).

Although there have been some forty Holy Shrouds—along with other "relics" of Jesus, including vials of his tears and countless pieces of the True Cross—there is no record of the Turin cloth until the mid-1350s. At that time a French bishop, Henri de Poitiers, was suspicious of its utter lack of provenance, questioning why the early evangelists had failed to mention such a marvel or why it had remained hidden for thirteen centuries. The shroud's owner, a soldier of fortune named Geoffroy de Charny, never explained how he, a man of modest means, had acquired the most holy relic in all of Christendom (Nickell 1988).

According to a later bishop's report to Pope Clement VII, dated 1389, Henri discovered that the shroud originated as part of a phony faith-healing scheme. "Pretended miracles" were staged, said the report's author, Bishop Pierre D'Arcis, "so that money might cunningly be wrung" from unsuspecting pilgrims. "Eventually, after diligent inquiry and examination," he stated, Bishop Henri "discovered the fraud and how the said cloth had been cunningly painted, *the truth being attested by the artist who had painted it,* to wit, that it was a work of human skill and not miraculously wrought or bestowed." (Emphasis added.)

That the shroud is indeed the work of a medieval artist would explain numerous image flaws. For example, the physique is unnaturally elongated (like figures in Gothic art!). Also, the hair hangs as for a standing rather than recumbent figure, and the imprint of a bloody foot is incompatible with the outstretched leg to which it belongs.

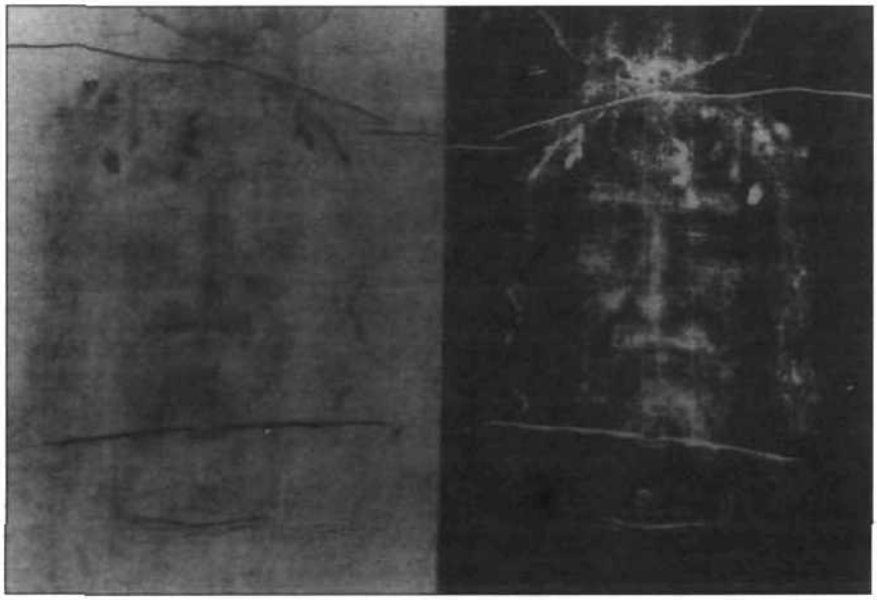

Figure 1. Positive and negative photographs of the face on the Shroud of Turin. A medieval artist reportedly admitted it was his handiwork, and scientific analyses confirm the presence of tempera paint.

Everywhere the "blood" flows are unrealistically neat. Instead of matting the hair, for instance, they run in rivulets on the outside of the locks. And even the *dried* blood has implausibly transferred. In addition, real blood soaks into cloth and spreads in all directions, rather than leaving picturelike images. As the noted pathologist Dr. Michael Baden observes of the overall shroud image, "Human beings don't produce this kind of pattern" (Baden 1980).

The shroud exhibits many features that point specifically to artistry. For example, while St. Augustine lamented in the early fifth century that nothing whatsoever was known of Jesus' appearance, the shroud image portrays the traditional, evolved artistic likeness. Also, by the eleventh century, artists were representing Jesus' burial with a double-length linen cloth and the hands crossed over the groin (unlike Jewish burial practice in which they were typically folded on the chest). And from the thirteenth century we find ceremonial or symbolic shrouds bearing full-length embroidered images of Christ's body in this crossed-hands pose.

Scientific Analyses

The question of artistry versus authenticity is especially addressed by scientific examination of the "blood." In 1973, as part of a special commission of scientists and scholars, internationally known forensic serologists subjected the blood-stains to a battery of scientific tests, all of which proved negative: the substance lacked the properties of blood. These tests included chemical analyses, thin-layer chromatography, and neutron activation analysis, as well as attempts to identify blood group and species. In fact, the scientists discovered reddish granules that would not even dissolve in reagents that dissolve blood. Subsequently the distinguished micro-analyst Walter McCrone identified the blood as red ocher and vermilion tempera paint, which explained why it was bright red after at least seven centuries.

McCrone (who was, he says, "drummed out" of STURP for his efforts) also discovered that on the image—but not on the background—were significant amounts of the red ocher pigment. He first thought this was applied as a dry powder but later concluded it was a component of dilute paint applied in the medieval grisaille (monochromatic) technique. (McCrone believes the artist worked freehand; another possibility is shown in Figure 2.) (McCrone 1996)

In 1988 the shroud cloth was finally carbon dated. Using accelerator mass

Figure 2. Negative photograph of an image produced by making a rubbing from a bas-relief. Such a technique (using pigment or paint) automatically converts the usual lights and darks into a quasi-negative, shroudlike picture.

spectrometry, laboratories at Zurich, Oxford, and the University of Arizona obtained dates in very close agreement (Damon, et al. 1989). These were given added credibility by correct radiocarbon dates from a variety of control swatches, including a piece from Cleopatra's mummy cloth. The resulting age span was circa A.D. 1260–1390, or about the time Bishop Henri de Poitiers found the artist who admitted it was his creation.

Rationalizations

Recently shroud scientists have claimed that microbial contamination may have altered the radiocarbon date; however, for there to be an error of thirteen centuries there would have to be twice as much contamination by weight as the shroud cloth itself! (Pickett 1996)

Another recent claim concerns reported evidence of human DNA in a shroud "blood" sample. Actually, the scientist cited, Victor Tryon of the University of Texas, insists that "Everyone who has ever touched the shroud or cried over the shroud has left a potential DNA signal there." Tryon resigned from the new shroud project due to what he disparaged as "zealotry in science." (Van Biema 1998, p. 61)

By such rationalizations and questionable evidence sindonologists promote their agenda. They offer one explanation for the contrary gospel evidence (*maybe* certain passages require clarification), another for the lack of historical record (*maybe* the cloth was hidden away), still another for the artist's admission (*maybe* the reporting bishop misstated the case), yet another for the paint pigments (*maybe* an artist who copied the shroud ritualistically pressed it to the image), and so on. This should be called the "maybe" defense. It is all too characteristic of sindonology, which has failed to produce any scientifically viable hypothesis for the image formation.

Corroborative Evidence

The scientific approach, in contrast, is to allow the preponderance of prima facie evidence to lead to a conclusion: the shroud is the handiwork of a medieval artisan. The various pieces of the puzzle effectively interlock and corroborate each other. For example, the artist's admission is supported by the lack of prior record, as well as by the revealingly red and picturelike "blood" that, in turn, has been identified as tempera paint. And the radiocarbon date is consistent with the time the artist was discovered.

Given this powerful, convincing evidence, it is unfortunate that we must now once again recall the words of Canon Ulysse Chevalier, the Catholic historian who brought to light the documentary evidence of the shroud's medieval origin. As he lamented, "The history of the shroud constitutes a protracted violation of the two virtues so often commended by our holy books: justice and truth."

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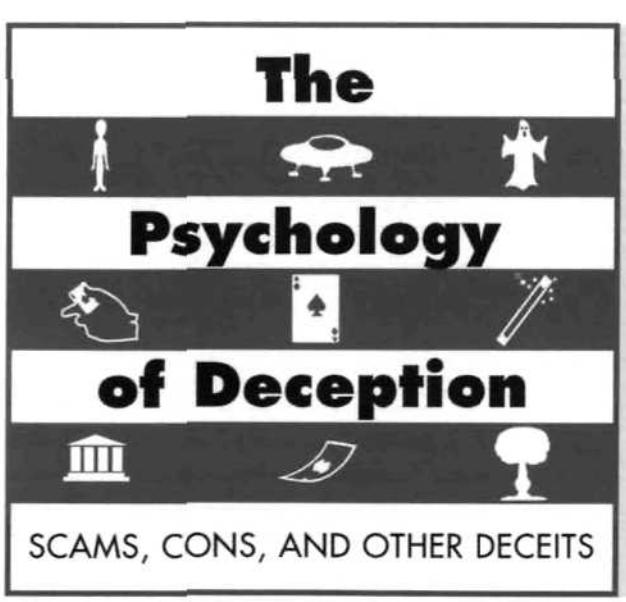

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Mars Global Surveyor Photographs 'Face on Mars'

DAVID MORRISON

One of the curiosities of the Viking spacecraft global mapping of Mars (1976–1977) was the discovery of a strangely shaped mesa in the Cydonia region that resembled a human face. The so-called "Face on Mars" was recognized by Viking scientists and included in one of the early mission news releases. At the low resolution and oblique lighting under which the Viking image was obtained, the mile-wide mesa has an eerie Sphinx-like appearance. In the original release, the effect was heightened by the fortuitous presence of black "drop-outs" where one nostril and one eye would be, but even after proper processing to remove these artifacts, the human resemblance remained.

Unfortunately a small band of individuals decided that this formation was an artificial, carved sculpture of a human face placed on Mars hundreds of thousands of years ago. A cult grew that tried to deduce the nature of the sculpture and who made it, with links to a variety of other pseudoscience cults such as that of the "crop circles." The leader of this group was former journalist Richard Hoagland, who wrote a book, *The Monuments of Mars,* and has appeared widely on the lecture circuit and talk radio. Hoagland expanded this story to book length by linking the Face to several nearby hills in Cydonia that he said were pyramids (what else!) and a ruined city. After extensive mathematical analysis of the latitude and longitude of these features and the angles of lines connecting them, he not only deduced the date for their construction but hinted that encoded in this extraterrestrial mathematics were scientific formulas that might reveal the source of unlimited nonpolluting energy. Branching out, Hoagland later released the startling discovery that Apollo-era lunar photos depict many artifacts of extraterrestrial engineering on the Moon, including a crystal dome tens of miles high. This time the press covered the story for its humorous value only, but questions have continued to be raised for the past two decades about the possible reality of the Face itself as an artifact of intelligent life on Mars.

In addition to promoting themselves and their publications, Hoagland and his followers developed a detailed conspiracy theory in which it was not stupidity that blinded NASA officials and planetary scientists to this evidence of advanced extraterrestrial life, but an intentional effort to deceive the public. From the beginning they accused NASA of suppressing additional Viking images of the Face, and of covering up other evidence of intelligent life on Mars while secretly planning to exploit this information. They even went so far as to picket JPL at the time of the failure of the Mars Orbiter spacecraft, which ceased to function in 1992 just before it was to begin a high-resolution orbital survey of the Red Planet as a follow-up to Viking. Stories circulated that the "failure" of Mars Observer was itself a fake, and that the real secret mission of Mars Observer was to photograph the Face.

The high-resolution Mars Orbiter Camera (MOC) was reflown on the next available mission, the Mars Global Surveyor, which arrived at Mars in 1997. Mars Surveyor is part of a NASA program to place an orbiter around Mars and a lander on its surface at every opportunity over the next decade when Earth and Mars are properly aligned (roughly once every 26 months). The first two of these Mars missions were Mars Pathfinder, which landed on the surface on July 4, 1997, and Mars Global Surveyor, which arrived a couple of months later and is now in the midst of a long period of adjustments leading toward its final mapping orbit. On April 5, 1998, in Orbit 220, the MOC obtained an oblique image of the Face at a resolution of 4.2 m/pixel, a factor-of-ten improvement in linear resolution over the best Viking image.

Immediately released by NASA, the new image of the Face shows a low mesa-like hill cut crossways by several roughly linear ridges and depressions,

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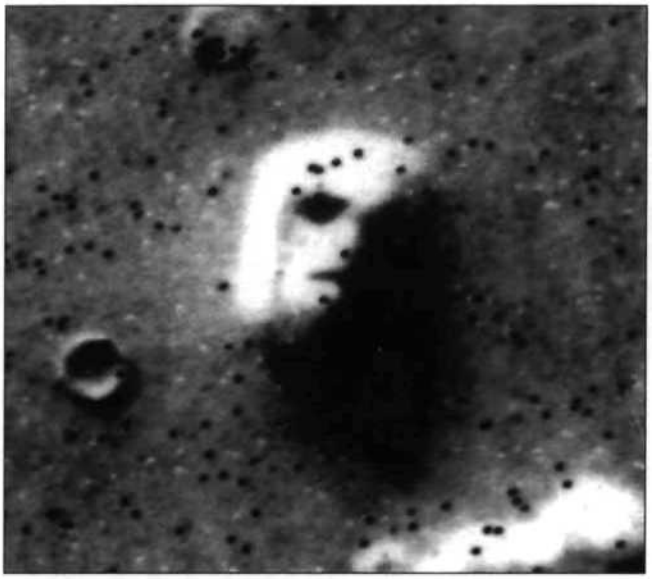

Photo 1: The "Face on Mars" photo taken by the Viking 1 Orbiter, 1976–1977.

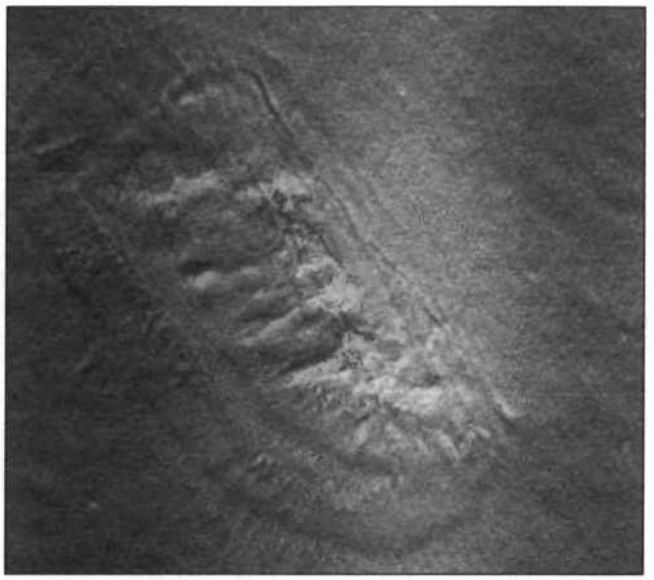

Photo 2: The same region photographed by the Mars Global Surveyor, 1998.

which were misidentified in the 1976 photo as the eyes and mouth of a face. The hill is surrounded by an apron of smooth eroded material that produced the effect of a halo or puffy wig in the Viking image. At high resolution, the entire Cydonia area shows much greater evidence of erosion than was evident from Viking orbital photography. Only with a large dose of imagination can any resemblance to a face be seen in the new MOC image, which is an example of how dramatically our interpretation of geology changes with large improvements in resolution. Compared to various rock formations on Earth that have a human resemblance, the Face on Mars is a pretty poor specimen, recognizable only at very low resolution.

After 20 years of promoting pseudoscientific interpretations and various conspiracy theories, will the Face on Mars cult now accept reality? Probably they will find a way out, perhaps by claiming that NASA faked the new image. Shortly after the picture was released, one caller to the Art Bell "Coast to Coast" show suggested a remarkable new interpretation to the Mars Observer failure: that as part of its secret mission the spacecraft not only photographed the Face at high resolution but then obliterated it with a nuclear bomb to destroy this artifact forever. Apparently devoted conspiracy buffs just never give up, but at least we may hope the responsible press will now drop this subject and leave it to the supermarket tabloids where it belongs. ☐

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Magnetic Therapy:
Plausible Attraction?

Long considered only a component of quack medicine, magnetic therapy has received a boost from a recent study at the Baylor College of Medicine. Is it plausible?

JAMES D. LIVINGSTON

A double-blind study at Baylor College of Medicine, published last November in *Archives of Physical and Rehabilitation Medicine* (Vallbona 1997), concluded that permanent magnets reduce pain in post-polio patients, and the results were heralded in *The New York Times* and on Bryant Gumbel's *Public Eye.* PBS's *Health Week* and *Time* magazine recently reported on the growing use of magnets by champion senior golfers and other professional athletes to relieve pain. Magnetic pain relief products are now sold in many golf shops, and ads for them appear in national golf and tennis magazines. Long a significant component of the health industry in Japan and China, magnetic therapy is becoming a more and more visible part of the alternative-medicine boom in the United States and Europe. Is it all just hokum, as many previously assumed, or is magnetic therapy becoming scientifically respectable?

Early History

For thousands of years, wonder and magic were associated with the mysterious forces exerted by natural magnets—magnetite-rich rocks, today called lodestones. Many trace magnetic therapy back to Paracelsus (1493-1543), a physician and alchemist who reasoned that since magnets have the power to attract iron, perhaps they can also attract diseases and leach them from the body. Charles Mackay, in *Extraordinary Popular Delusions and the Madness of Crowds* (1841), says of Paracelsus that "his claim to be the first of the magnetisers can scarcely be challenged." But Paracelsus was also aware of the important role of the patient's mind in the process of healing (Buranelli 1975). He wrote, "The spirit is the master, the imagination is the instrument, the body is the plastic material. The moral atmosphere surrounding the patient can have a strong influence on the course of the disease. It is not the curse or the blessing that works, but the idea. The imagination produces the effect." Paracelsus was apparently well aware of the placebo effect.

The development in eighteenth-century England of carbon-steel permanent magnets more powerful than lodestones brought renewed interest in the possible healing powers of magnets, and among those interested was Maximilian Hell, a professor of astronomy at the University of Vienna. Hell claimed several cures using steel magnets, but he was rapidly eclipsed by a friend who borrowed his magnets to treat a young woman suffering from a severe mental illness. The friend was Franz Anton Mesmer (1734-1815), and Mesmer's success with the "magnets from Hell" led directly to his widespread promotion of his theory of "animal magnetism." Although he first used actual magnets, he later found he could "magnetize" virtually anything—paper, wood, leather, water—and produce the same effect on patients. He concluded that the animal magnetism resided in himself, the various materials simply aiding the flow of the "universal fluid" between him and the patients.

Mesmer became so successful in Paris that in 1784 King Louis XVI established a Royal Commission to evaluate the claims of animal magnetism, a commission that included Antoine Lavoisier and Benjamin Franklin among its members. They conducted a series of experiments and concluded that all the observed effects could be attributed to the power of suggestion, and that "the practice of magnetization is the art of increasing the imagination by degrees." Thomas Jefferson, arriving in Paris soon after the Commission report, noted in his journal: "Animal magnetism is dead, ridiculed."

Ridiculed, perhaps, but not dead. Mesmer himself faded from public view, but "magnetizing" persisted in various forms.

James D. Livingston now teaches in the Department of Materials Science and Engineering at the Massachusetts Institute of Technology, and was for more than thirty years a physicist at General Electric's Corporate Research and Development Center. He is the author of Driving Force: The Natural Magic of Magnets *(Harvard, 1996), a popular-science book on the history, legends, science, and technology of magnets.*

Many early magnetizers evolved into students of hypnosis and developed various forms of hypnotherapy. (The trance induced in many of Mesmer's patients is thought to be what is now called a hypnotic trance, and most dictionaries today list mesmerism as a synonym for hypnotism.) One American who became interested in magnetic healing was Daniel David Palmer, who opened Palmer's School of Magnetic Cure in Iowa in the 1890s. His ideas developed into the system of hands-on therapy known as chiropractic. Others focused on hand gestures without actual touch, an approach recently reborn as "therapeutic touch." [See "Catching Up With Eighteenth Century Science in the Evaluation of Therapeutic Touch, " by Thomas S. Ball and Dean D. Alexander, this issue, p. 31] Mary Baker Eddy was "cured" by a magnetizer, but she later became convinced that cures could best be achieved through prayer, and founded Christian Science.

Most of these byproducts of mesmerism, like Mesmer himself, ceased to use actual magnets. But the development of electrical technology in the late nineteenth century impressed the general public with the mysterious powers of electric and magnetic fields, and therapeutic magnets had a rebirth, with many "doctors" promoting magnets to relieve pain, enhance sleep, and cure a wide variety of diseases. The most notable of these was Dr. C. J. Thacher, whom *Collier's Magazine* dubbed "King of the magnetic quacks" (Macklis 1993). His 1886 mail-order catalogue offered a variety of magnetic garments, and a complete costume contained more than 700 magnets, which provided "full and complete protection of all the vital organs of the body."

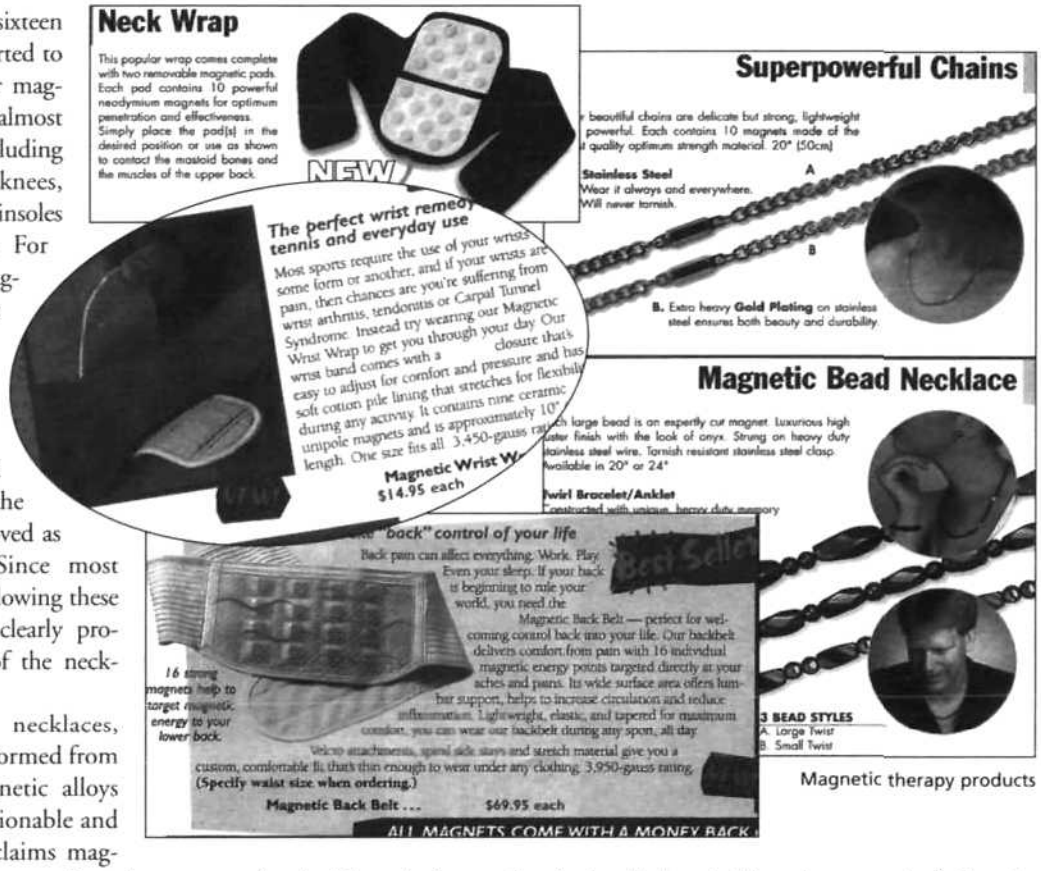
In the twentieth century, materials scientists and engineers have developed stronger and stronger permanent magnets—alnico magnets in the 1930s, ferrite (ceramic) magnets in the 1950s, and rare-earth magnets in the 1970s and 1980s. The latest rare-earth magnets, neodymium-iron-boron, are more than a hundred times more powerful than the steel magnets available in the last century to Edison, Bell, and C. J. Thacher (Livingston 1996). Both ferrite magnets and the latest "neo" magnets have had a tremendous impact on modern technology, but they have also restimulated interest in the use of permanent magnets for magnetic therapy. Most magnetic therapy products today, like most refrigerator magnets, contain inexpensive ferrite magnets, but many suppliers offer neodymium "supermagnets" in their top-of-the-line products.

Magnetic Therapy Today

Both ferrite and rare-earth magnets, unlike earlier magnetic materials such as steels and alnicos, have great resistance to demagnetization, allowing thin disks to be magnetized. (Earlier magnets had to be long and thin to avoid being demagnetized by the internal fields produced by the poles at the ends.) This feature allows modern magnets to be mounted in a variety of thin products that can be applied to the body with the magnetic field emanating from the surface.

Some suppliers recommend applying magnetic patches directly to your aches and pains, while others recommend applying small Band-Aid-like patches to acupuncture points.

Magnetic belts containing sixteen or more magnets are purported to ease back pain, and similar magnetic wraps are offered for almost any part of the body, including hands, wrists, elbows, knees, ankles, and feet (magnetic insoles are particularly popular). For headaches you can wear magnetic headbands, magnetic earrings, or magnetic necklaces. (One company marketing magnetic necklaces provides simple instructions: the necklace should be put on as soon as the headache appears and removed as soon as it goes away. Since most headaches come and go, following these instructions precisely will clearly produce persuasive evidence of the necklace's efficacy.)


Neck Wrap
This popular wrap comes complete with two removable magnetic pads. Each pad contains 10 powerful neodymium magnets for optimum penetration and effectiveness. Simply place the pad(s) in the desired position or use as shown to contact the mastoid bones and the muscles of the upper back.
NEW!
Superpowerful Chains
Stainless Steel
Wear it always and everywhere. Will never tarnish.
B. Extra heavy Gold Plating on stainless steel ensures both beauty and durability.
Magnetic Bead Necklace
3 BEAD STYLES
A. Large Twist
B. Small Twist
Magnetic Back Belt ... $69.95 each
(Specify waist size when ordering.)
ALL MAGNETS COME WITH A MONEY BACK
Magnetic therapy products

Many magnetic necklaces, bracelets, and earrings are formed from silver- and gold-rich magnetic alloys and promoted as both fashionable and therapeutic. One catalog claims magnetic earrings "stimulate nerve endings that are associated with head and neck pain," and magnetic bracelets "act upon the body's energy field" and "correct energy imbalances brought by electro-magnetic contamination or atmospheric changes." Larger items include magnetic seat cushions, magnetic pillows, and magnetic mattress pads, the last claiming to produce an "energizing sleep field." One supplier offers a PCD—Prostate Comfort Device for older men. If properly placed while you sit watching television or driving your car, you will no longer have to get out of bed several times a night to relieve yourself!

To avoid trouble with the Food and Drug Administration, most suppliers emphasize only "comfort" and usually specifically state "no medical claims are made." Some, however, are far less careful. One company in Kansas markets a book entitled *Curing Cancer With Supermagnets*. The authors of the book claim to have cured cancer simply by hanging a neodymium "supermagnet" around the patient's neck. The cancer discussed in the advertisement was a breast cancer, but they report that "the supermagnets influence the whole body" and "our method can cure all types of cancer."

Many magnetic therapy products have alternating arrays of north and south poles facing the patient. Some have detailed explanations of why a circular pattern of poles is optimal, while others offer poles in checkerboard or triangular patterns. Nikken, the Japan-based firm that has used a multilevel marketing scheme to expand from an annual business in the U. S. of $3 million in 1989 to $150 million today, primarily offers products with alternating poles.

One clear difference between such multipolar magnetic devices and unipolar devices (with only one pole facing the patient) is the "reach" of the magnetic field. The field from even unipolar magnets decreases very rapidly with increasing distance from the magnet, but the field from multipolar magnets decreases much more rapidly. If multipolar magnets really have any effects on the human body, they will be limited to depths of penetration of only a few millimeters. (Many refrigerator magnets are multipolar, which limits the thickness of paper they can hold to the refrigerator, but also limits the damage they can do to nearby credit and ATM cards.)

Other suppliers offer only unipolar magnets, and some emphasize the importance of having only south-seeking poles facing the body. Contrary to common scientific usage, they call south-seeking poles north poles. Since opposite poles attract, they argue that a pole that seeks south must be a north pole. (Here practitioners of magnetic therapy are perhaps more logical than mainstream science, which calls the south-seeking pole a south pole, requiring that the earth's magnetic pole in Antarctica is, by the standard scientific terminology, a north pole.) Dr. Buryl Payne, in his book *The Body Magnetic* (1988), argues that south-seeking poles calm tissue but north-seeking poles stimulate tissue, and you should therefore never expose tumors or infections to north-seeking poles. When I suggested to one practitioner that different effects from different poles seemed to violate basic rules of symmetry, he assured me that the rules were reversed in the southern hemisphere.

One of the most ardent advocates of magnetic therapy is Dr. William Philpott of Oklahoma, who publishes his own Magnetic Energy Quarterly. He is also on the board of the

Biomagnetic Pseudoscience and Nonsense Claims

The following is a short excerpt from an updated version of a paper titled "Magnetotherapy, the Latest Magic Touch" presented at the Ninth European Skeptics Conference, in La Coruna, Spain, September 4-7, 1997.

Miguel A. Sabadell

One of the main ways magnetotherapy is applied is through the use of permanent magnets. According to proponents, you can get their benefits as follows:

1. *Local application:* Effects depend drastically on which pole you apply. North pole: against pain, inflammatory and infectious processes. South pole: provides strength and energy. Does your shoulder hurt? No problem. Put the north of one of the magnets on the front of your shoulder and the south of the other one on the back of it (like a sandwich).
2. *General application:* The aim of this method is to provide a general magnetic flow inside the body. This helps to regulate the disorders of the organism. A correct application of the general method is said to involve a deep knowledge of the polarity of the human body and its affinity with therapeutic magnets.

Proponents contend that the north pole has negative electric potential and south, positive (nonsense x 10^{10}) and that it has been established (by whom?) that the front and the right side of the human body are positives, and back and left side, negatives. So on the right side you must apply north and on the left the south. Pay attention to the extraordinary therapeutic: if your illness is above the waist, you must correctly apply the magnets on the palms of your hands. But if your sickness is below the waist then magnets must be placed below your feet. Isn't it great?

Their claims.— The following collection of nonsense claims about magnetotherapy has been compiled from booklets and radio programs. In parenthesis are my comments, perhaps cynical but . . . who could help it?

- The Earth's magnetic field has fallen fifty percent in the last centuries and five percent in the last hundred years. This falling has provoked an increase in common diseases. This is called Magnetic Field Deficiency Syndrome. Such effect has increased because of modern life, immersed in a world of iron, steel and concrete. The modern world deprives us of the healthy influence of the natural (*of course!*) magnetic field necessary to maintain our bioelectric cellular equilibrium. (??)
- Cells work better in the presence of magnetic fields. Experiments with plants prove it. (*Which ones?*)
- Cells live on magnetic energy, and most of this energy is provided by water. (*It is true. I feel better when I eat a juicy magnetic steak*)
- In big cities the magnetic field doesn't exist or it has been strongly modified. (*So you can not use a compass in a city, I suppose*)
- Spring water is magnetized. But if you bottle it, after five days it loses its power.
- Water has a magnetic potential (*?*) that we can help to recover. (*This sounds Aristotelian, doesn't it?*)
- The natural phase of water is gaseous, but the Earth's magnetic field and its uncommon properties make it liquid. (*No comments. The ways of illiteracy are endless*).
- Magnetic water loses its curative properties in contact with metals. (*Who doubts it?*)
- Illness is caused by losing energetic equilibrium, and magnetotherapy helps to recover it. (*I think you had better plug in. Everything works better if it is plugged in*)
- Eighty percent of common diseases have their origin on Magnetic Field Deficiency Syndrome. (*Why are you laughing?*)
- Magnetotherapy was known by Chinese, Egyptians, and Indians 3,500 years ago. (*Neither Egyptians nor Chinese knew this therapeutic use of magnets. Egyptians probably didn't even know the existence of magnets.*)
- Magnetic water is based on the principle of electromagnetic induction discovered by Faraday. How? In their words, we have a water flow (*doubtless it is a current*) and a magnet, so . . .
- Louis Pasteur studied the effect of magnets on plant growth and on fruit enzymes. (*Sure?*)
- The magnetic field modifies water structure, changing some of its physical properties.
- In the body, the magnetic field increases the dilution of oxygen in plasma, transporting more oxygen together with the hemoglobin mechanism. (*Give them the Nobel Prize for Medicine!*)
- Osteoporosis is caused by the absence of the Earth's magnetic field. Space agencies use magnetotherapy to help their astronauts recover. (*Absolutely false. Osteoporosis occurs during space flight because of weightlessness. There is no more stress on the weight-bearing bones of the body when in orbit, and so calcium tends to be absorbed in the bloodstream. The same thing happens on Earth to patients who are in bed for long periods of time, and to people who have to keep one leg suspended or non-weightbearing due to disease or fractures. The "cure" for this problem seems to be to provide exercises that will periodically stress these bones, such as running on a treadmill or doing squatting exercises. Some investigators have tried electrical stimulation on legs to promote bone growth, but it has not worked so far.*)
- In 1777, two French medical doctors, Androy and Thouret, gave their approval to magnetotherapy in a session of the Royal Society of Medicine. (*I don't know if it was actually passed; it seems so. In the eighteenth century, therapies included unguents, purges, and bleedings. As with homeopathy, such a harmless and inoffensive treatment was better than real medicine!*)

Medical applications.— After this wonderful exhibition of deep scientific knowledge we could expect specific treatments for different diseases. It's amazing (well, not much from what have seen so far), that only *one* treatement is needed to help nearly eighty common diseases: (1) Apply the therapeutic magnets following the general method; (2) Apply the therapeutic magnets in the zone of the disease. North is for pain; south is to recover lost energy and vitality; (3) Drink magnetic water. It's so easy . . . By this method you can get cured of: abscess, acne, allergy, anaemia, arthritis, asthma, bronchitis, cellulitis, sciatic, diabetes, diarrhea, dyspepsia, stringent, frigidity, impotency, flu, herpes, headaches, zoster and a lot more! Some of the supposed 'cures' are quite obvious. For example, for stringent they recommend drinking two or three litres of magnetic water daily (if you don't succeed after drinking three litres, what else can you do?). Or to gargle with magnetic water and lemon juice if you suffer pharyngitis (my grandmother said that it is better to use lemon juice and honey . . .) Finally, it is quite impressive to learn that to cure for *all* child diseases we must only apply low power magnets and make them drink magnetic water.

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Bio-Electro-Magnetics Institute of Reno, Nevada, a nonprofit "research and educational organization" and an advisor to the NIH Office of Alternative Medicine. His wife happens to have a business selling "Polar Power Magnets." Dr. Ronald Lawrence of California is President of the North American Academy of Magnetic Therapy and reports that he has successfully used magnets to relieve pain in hundreds of his patients. He is associated with Magnetherapy, a Florida company that markets "Tectonic Magnets." Both Dr. Philpott and Dr. Lawrence favor unipolar magnets.

The efficacy of magnetic therapy (or of any other medical treatment, mainstream or alternative) does not depend on our understanding the biological mechanism. Nevertheless most promoters of magnetic therapy recognize the need for offering some plausible explanation. The mechanism most commonly offered for various therapeutic effects of magnets is improved blood circulation, despite a lack of clear evidence for such an effect. Other suggestions include alteration of nerve impulses, increased oxygen content and increased alkalinity of bodily fluids, magnetic forces on moving ions, and decreased deposits on the walls of blood vessels.

The broadest explanation was presented by Dr. Kyochi Nakagawa of Japan, who claims that many of our modern ills result from "Magnetic Field Deficiency Syndrome." The earth's magnetic field is known to have decreased about 6 percent since 1830, and indirect evidence suggests that it may have decreased as much as 30 percent over the last millennium. He argues that magnetic therapy simply provides some of the magnetic field that the earth has lost.

Magnetic therapy is also prominent in the treatment of thoroughbred racehorses. An injured racehorse represents potential loss of a substantial investment, providing considerable incentive to try "alternative medicine" to supplement mainstream veterinary treatment. Magnetic pads for a variety of leg problems, magnetic blankets, magnetic hoof pads, etc., all get ringing endorsements from many horse trainers—and even some veterinarians. One marketer of magnetic products for humans reports that he first became convinced of their effectiveness when he used them on his ailing llama! Enthusiasts argue that the placebo effect could not be effective on horses or other animals, but forget that it may influence the human who is interpreting the effect of magnetic therapy on the animal.

The Baylor Study

These examples and the centuries-old connection between magnets and quackery, have led many to consider modern magnetic therapy as total hokum, with the many testimonials for the success of magnetic treatments explainable by placebo effects. But the Baylor study, seemingly a careful double-blind study, has surprised many.

The study was conducted by Dr. Carlos Vallbona on fifty post-polio patients at Baylor's Institute for Rehabilitation Research in Houston. Bioflex, Inc., of Corpus Christi provided both the magnets (multipolar, circular pattern) and a set of visually identical sham magnets to serve as controls. To keep the study "double-blind" neither the patients nor the staff were informed as to which devices were active magnets, and which were shams. Before and after the forty-five-minute period of magnet therapy, the patients were asked to grade their pain on a scale from 0 to 10. The twenty nine patients with active magnets reported, on average, a significant reduction of pain (from 9.6 to 4.4), while the twenty-one patients with shams reported a much smaller average reduction (from 9.5 to 8.4). This is a substantial difference, and if the double-blind study was successfully conducted, cannot be explained by a placebo effect.

For a hardened skeptic, some doubts remain. Both Dr. Vallbona and his colleague, Dr. Carlton Hazlewood, had reported the successful personal use of magnets to relieve their own knee pains prior to the study, raising doubts as to their objectivity. Conscious or unconscious biases of researchers can have very subtle and unrecognized effects on the results of their studies, and a serious difficulty of conducting any double-blind studies with magnets is the ease of distinguishing active magnets from sham magnets (although the patients were reportedly observed during the therapy period to assure that they were not surreptitiously testing their magnets). Another difficulty of any studies of pain relief is the highly subjective nature of the data.

One marketer of magnetic products for humans reports that he first became convinced of their effectiveness when he used them on his ailing llama!

Despite these various reasons for caution, the results of this study have altered the views of many physicians. Dr. William Jarvis, president of the National Council Against Health Fraud, had formerly dismissed magnet therapy as "essentially quackery." He now tentatively admits that it may have value for post-polio pain.

More studies will be needed before magnetic therapy will be accepted by a majority of the medical community, and some studies are already underway. Last year the NIH Office of Alternative Medicine gave a million-dollar grant to Dr. Ann Gill Taylor of the School of Nursing of the University of Virginia to study the use of magnets to relieve pain. Among other things, she will be testing the effectiveness of magnetic sleep pads in relieving pain in patients suffering from fibromyalgia, a common disease involving joint and muscle pain. While we wait for the results of these and other studies, does what we know about magnetic fields and the human body make it plausible that magnetic therapy for pain might have a physical basis beyond mind/body effects?

Magnetic Fields and the Body

The electrochemical processes of the human body are extremely complex and incompletely understood, and physical

effects of magnetic fields cannot be ruled out. Many thousands of papers have in fact been published on biological effects of electromagnetic fields, much of it focused on the effects of radio-frequency and microwave fields or, in recent years, on fields at power-line frequencies (fifty or sixty cycles per second). Studies of biological effects of steady magnetic fields (reviewed by Frankel and Liburdy 1996) have concentrated mostly on high fields of the level encountered in MRI magnets, typically of the order of 10,000 gauss (1 tesla). Unfortunately, research has been very limited at field levels typical of magnetic therapy products, most of which are limited to a few hundred gauss, even at the magnet surface. (The earth's field is a bit less than half a gauss.)

Viewed simply as inert material, the human body, like its primary constituent, water, is *diamagnetic,* i.e., weakly repelled by magnetic fields. In response to an applied magnetic field, the electrons in water molecules make slight adjustments in their motions, producing a net magnetic field in the opposing direction about 100,000 times smaller than the applied field. With the removal of the applied field, the electrons return to their original orbits, and the water molecules once again become nonmagnetic. (We perhaps should note that some promoters of magnetic therapy also promote "magnetized water." You can't magnetize water. Although water responds weakly to an applied field, the response disappears as soon as the field is removed.) Although the diamagnetism of water and most living things is very weak, a high-field electromagnet producing 160,000 gauss (16 tesla) at the center of the coil has recently been used to levitate not only water drops but also flowers, grasshoppers, and small frogs (Berry and Geim 1997), the "flying frogs" drawing worldwide media coverage. Since fields of that magnitude are required to balance gravitational forces, the much lower fields of magnetic-therapy devices can only produce diamagnetic forces that are thousands of times smaller than gravity. (The repulsive force will be proportional to the product of the field and the field gradient.)

Some dubious literature suggests that magnetic fields attract blood, citing all the iron it contains. However, iron in the blood is very different from metallic iron, which is strongly magnetic because the individual atomic magnets are strongly coupled together by the phenomenon we call *ferromagnetism.* The remarkable properties of ferromagnetic materials are a result of the cooperative behavior of many, many magnetic atoms acting in unison. The iron in blood consists instead of isolated iron atoms within large hemoglobin molecules, located inside the red blood cells. Although each of the iron atoms is magnetic, it is not near other iron atoms, and remains magnetically independent.

The net effect of the weak *paramagnetism* of the isolated iron atoms in hemoglobin is only a slight decrease in the overall diamagnetism of blood. Blood, like water, is weakly repelled by magnetic fields, not attracted.

Although most components of the human body and other living things are weakly diamagnetic, many organisms have been shown to contain small amounts of strongly magnetic materials, usually magnetite (Fe_3O_4). The most extreme case is that of magnetotactic bacteria, originally found in mud collected from the marshes of Cape Cod. Each contains a long chain of magnetite particles that interact strongly enough with the earth's magnetic field to orient the bacteria along the field. Magnetite crystals have also been found in pigeons, honeybees, many mammals, and even in the human brain, but in proportionately much smaller amounts than in the bacteria. It seems very unlikely that there is enough magnetite within the human body to provide a possible mechanism to explain magnetic therapy. However, if magnetite particles were located at strategic places, they could locally amplify the effects of low magnetic fields and, for example, modify ion flow across cell membranes, of the type involved with electrical transmission in nerve cells.

More likely mechanisms are those based on magnetic forces on moving charged particles, possibly including ions or charged molecules in flowing blood, moving across cell membranes, moving across synapses between nerve cells, etc., or those based on more subtle effects on biochemical reactions (Frankel and Liburdy 1996). Although no physical mechanisms for magnetic therapy have been established, the possibilities are numerous and complex. Only further clinical tests, carefully controlled to account for placebo effects, can confirm or dispute the results of the Baylor study and prove or disprove the claims of magnetic therapy.

Some media reports have not sufficiently distinguished the Baylor form of magnetic therapy, based on modest static fields from permanent magnets, with a more accepted form of "magnetic therapy" based on high pulsed magnetic fields from electromagnets (Malmivuo and Plonsey 1995). Pulsed magnetic fields are very different from static magnetic fields, because, via Maxwell's equations, time-varying magnetic fields induce electric fields. Electric fields have pronounced biological effects, particularly on nerve and muscle cells, as we have known since the days of Galvani and his twitching frogs' legs. Many years ago the FDA approved the use of pulsed magnetic fields in "bone growth stimulators" for the treatment of fractures that were slow to heal, and research on "magnetic stimulation"—pulsed magnetic fields applied to the brain or other components of the nervous system—has grown rapidly in recent years. Transcranial magnetic stimulation, in which the patient receives hundreds of magnetic field pulses of 1 tesla or more, each only a millisecond in duration, has shown considerable promise as a means of treating depression. However, these forms of pulsed-field magnetic therapy are based on biological effects of induced electric fields, and are very different from the use of the static fields from permanent magnets.

Conclusions

Claims of therapeutic effects of permanent magnets should still be regarded with considerable skepticism. Most of the many testimonials to the effectiveness of magnetic therapy devices can be

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Catching Up with Eighteenth Century Science in the Evaluation of Therapeutic Touch

Eighteenth century research on Mesmer's Animal Magnetism, as well as some contemporary studies, shed light on the misattributions that underlie the persistence of Therapeutic Touch as a movement.

THOMAS S. BALL and DEAN D. ALEXANDER

It hardly seems possible that insights promulgated in 1784 could shed new and much needed light on a current scientific issue. Yet in the evaluation of claims for at least one form of paranormal healing, Therapeutic Touch, we have yet to replicate the clear and parsimonious reasoning demonstrated in that bygone era in the investigation of Animal Magnetism. The following historical inquiry is made possible by the fact that Therapeutic Touch is, in many respects, Animal Magnetism in modern dress.

In the past few years Therapeutic Touch has gained a powerful foothold in the American nursing profession (Bullough and Bullough, 1993; Scheiber and Selby 1996). What is Therapeutic Touch? According to Dolores Krieger, R.N., its leading proponent, "Therapeutic Touch is a healing practice based on the conscious use of the hands to direct or modulate,

for therapeutic purposes, selected nonphysical human energies that activate the physical body" (Krieger 1993, 3–4). By centering your consciousness, "you will have stepped into another, often unrealized dimension of yourself" (Krieger 1993, 19). Thusly prepared, through the palms of the hands held slightly above the body, the Therapeutic Touch practitioner can scan the body for every deficit or illness. The evidence that one has detected such "living currents of energy flow" comes through sensations such as tingling, heat, pressure, or elasticity. Following assessment of the patient's energy field, the practitioner, palms facing the patient and about two or three inches from his body, "rebalances the patient's energies." The practitioner sends energy from her hand chakras (energy centers) through the patient's energy field, thereby inducing a health-promoting energy flow.

In defining this "nonmaterial energy field that I cannot see or taste or smell," Krieger (1993, 16) draws upon metaphors such as that of steam power and electricity. Yet she admits that heat, one of the sensations practitioners sense through their hands, cannot be detected by scientific instruments such as the thermocouple. She concludes, "Obviously Therapeutic Touch deals with a very different aspect or conception of temperature differential than the one we currently understand in biophysics" (Krieger 1993, 31).

The scene changes to France in 1784. Anton Mesmer, a charismatic German physician, sought government approval of his practice of a treatment based on animal magnetism. He considered Animal Magnetism a physical force of supreme interest to the sciences. Mesmer included magnets in many of his treatments. Yet he also believed that this invisible force was contained in his own body and that he could direct it, for therapeutic purposes, from a distance of ten feet or more. He had only to point a finger toward his patient to induce a therapeutic "crisis," such as this one: "Bodies would begin to shake, arms and legs move violently and involuntarily, teeth chatter loudly. Patients would grimace, groan, babble, scream, faint, and fall unconscious" (Gould 1989, 14). With repeated provocation the attacks would gradually become less severe and eventually disappear, and recovery followed.

Mesmer conceptualized Animal Magnetism as a universal force manifested in everything from interplanetary gravitation to the ebb and flow of the sea, in the atmosphere and likewise in the human body where it directly affects the nerves. Magnetic therapy "corrects the unequal distribution of the nervous fluid and its confused movement with its uniform current and produces that condition which I call the harmony of the nerves" (Pattie 1994, 39). In other words, Mesmer was claiming to rebalance the patient's energies more than 200 years before Krieger.

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Anton Mesmer performs one of his miraculous cures in Vienna.

Certain paranormal themes have been reinvented over the centuries in both literate and preliterate societies. Once accepted, they shape thinking that leads to certain common deductions. Krieger does not mention Mesmer. Yet the common and apparently coincidental conceptual origins of Therapeutic Touch and Animal Magnetism are nowhere more evident than in the deduction that the postulated energies can be stored in both animate and inanimate objects. Krieger (1993) noted the following:

> Human energies, such as those dealt with in Therapeutic Touch can be directed intentionally into a wad of ordinary cotton batting. Cotton so treated will store the energy for a length of time, during which the energy can be felt by another person as a "fact" (p. 49).

The Polynesians attributed much the same characteristics to "mana," their concept of a universal, impersonal energy which could be stored in persons, objects, and places. Likewise, Mesmer believed he could communicate the "magnetic material" to such objects as bread, glass, steel, water, dogs, and human beings, leaving them charged with Animal Magnetism. We shall see the part that this belief played in the experimental evaluation of Animal Magnetism.

Possibly in response to the turmoil generated by Animal Magnetism, the French King Louis XVI appointed a commission to investigate the practice. The four commissioners appointed five additional commissioners including the

American ambassador, Benjamin Franklin, and Lavoisier, the chief founder of modern chemistry. The latter designed the scientific experiments. Avoiding a blind alley taken by several contemporary researchers and funding groups, they rejected Mesmer's demand that they focus on cures. This strategy was based upon a remarkably sophisticated appreciation of how psychological factors and the body's ability to heal itself confound the results of therapeutic studies. As noted by Pattie (1994), "The commissioners considered that their first duty was to find out whether animal magnetism existed; the question of its utility could be taken up only after the question of its existence had been answered affirmatively" (145–146).

In one experiment, a woman who claimed that she experienced warmth in any part of her body while receiving magnetism was blindfolded. "The parts of her body which were exposed, without her knowledge, to magnetism did not respond, but when she was made to believe that she was being magnetized while blindfolded, she felt the usual sensations, although nothing whatever was being done" (Pattie 1994, 148). From this study it was concluded that imagination controlled these sensations. In another experiment, the commission sought to test the power of imagination in the production of convulsions. A particularly susceptible subject was blindfolded and asked to touch four trees in succession, one of which had been charged with Animal Magnetism. At the fourth tree, 24 feet from the magnetized one, he fell in a convulsion, losing consciousness. Similarly, several nonmagnetized cups were presented in succession to another subject. The second cup agitated her somewhat and the fourth provoked a crisis. She was calmed afterwards by drinking from an additional cup that had, in fact, been magnetized. From their series of experimental findings the commission concluded that "imagination without magnetism produces convulsions and . . . magnetism without imagination produces nothing" and "that this fluid without existence is consequently without utility" (Pattie 1994, 151).

Mesmer cited the patients' experiences of sensations and therapeutic convulsions as evidence of the effects of Animal Magnetism. These were claimed to be the objective effects of a mysterious, invisible force.

In evaluating the existence of Krieger's version of such a force, our approach differed slightly from that of the French commission. This difference can be seen in the experimental evaluation of another paranormal phenomenon, dowsing. Dowsers claim that a source of underground water can be sensed through the movement of a hand-held divining rod. Edwards (1950) evaluated one water witch's claims by presenting him with a randomly arranged array of identical tin cans, all covered with plywood squares. The dowser's task was to position the divining rod over each can in succession and identify the water-filled ones. (He did not succeed.) Similarly, we assessed the ability of a practitioner to identify the physical presence or absence of a human subject.[1] Our practitioner's beliefs regarding detection through energy centers in the hands were identical to Krieger's.

The experimental room contained a single massage table. A segment of string was looped around the practitioner's neck and tied around the middle finger of his right hand. It was adjusted so that his hand would be poised approximately ten centimeters above the subject's back during the practitioner's scanning movements of his body. A mat was placed so that, once standing on it, the practitioner faced in the direction of and was centered over the subject's lower back. After the experimenter blindfolded the practitioner, he led him to an adjoining room. The experimenter then exited to the experimental room, closed the connecting door and silently signaled the subject to lie on the massage table. He then led the practitioner into the experimental room, informed him of the subject's presence on the massage table, and asked him to assess the subject's current energy level. It was reported as a three on a scale from zero to ten. The procedure was repeated with the subject seated approximately two meters from the practitioner, who was told the subject was absent. The practitioner was then asked to rate the presence of any body energy he could sense. It was zero. This preliminary assessment was conducted to ensure that the practitioner did not feel hampered in his ability to discriminate body energy by constraints imposed by the experimental procedures and to rule out possible negative results attributable to uncontrolled ambient factors such as the electrical field in the room or by skeptical attitudes or vibrations emitted by the experimenter. We then proceeded with the formal trials.

"Imagination without magnetism produces convulsions and . . . magnetism without imagination produces nothing"

In a randomized order, the subject was either present or two meters distant from the table in half of the trials. The practitioner was allowed to take as long as he desired for each trial. The practitioner verbalized his present versus absent judgment after exiting the experimental room following each assessment trial. Over a series of ten trials the practitioner discriminated at the chance level. In three of the trials he either reported the subject as present when he was not there or reported him absent when he was actually present. To paraphrase the 1784 Royal commission's conclusions, imagination without a body energy source produces tactile sensations and a body energy source without imagination produces nothing. (Similar results were obtained in another experiment in which two blindfolded practitioners were repeatedly asked to identify one of two subjects that they had preselected on the basis of contrasting levels of energy emissions.)

Another, more extended experiment by Rosa, Rosa, and Sarner (1996) did involve officially recognized practitioners trained in Therapeutic Touch. In this case, however, a blindfolded practitioner had to identify the location of the experimenter's hand, which was randomly placed over one or the other of the practitioner's hands. A series of fifteen practitioners were tested in the ability to make this series of discriminations. None exceeded the chance level of success.

In the French commission's experiments, assessment focused on energy flow from the practitioner (or an object that the practitioner had "charged with energy") to the subject. Conversely, whether from water to divining rod or from subject to practitioner's hands, the purported energy evaluated in the above-mentioned experiments was from emitting source to practitioner. In the case of Therapeutic Touch, the detection of an energy flow from subject to practitioner is the basis of diagnosis. Valid diagnosis cannot occur in the absence of such energy. Following essentially the same logic as the French commission, we concluded that unreliable diagnosis cannot form the basis for a valid treatment. Therefore, diagnosis rather than treatment goes to the heart of the issue. In the present case it was up to the practitioner rather than the client to identify the presence of an invisible force. As with Animal Magnetism, this biological force was purportedly manifested through physical sensations. Neither the movements of the dowser's divining rod nor the palm's sensations experienced by various energy therapists provided reliable data. Once again, it appears that imagination alone can produce seemingly validating sensations. What is the nature of this imagination?

Like Gould (1989), we believe that the "imagination" referred to by the French commission amounts to suggestion. Tingling and warmth are common hypnotic suggestions. Referring to contemporary practitioners of the "laying on of hands," no less an authority on hypnosis than Milton Erickson made the same observation. He cited "Occam's Razor," the principle that one must not introduce assumptions unnecessarily, when a phenomenon can be explained in terms of known relationships. While Krieger admits to the possible influence of the placebo effect as a contributor to a limited number of Therapeutic Touch cures, autosuggestion is never mentioned as a factor in either diagnosis or treatment. However, the Therapeutic Touch student is primed for just such experiences both by hypnotic induction-like preparatory exercises and by specific suggestions (Krieger 1993, 20–31).

Autosuggestion may support specious validation. Yet it does not follow that practitioners of Therapeutic Touch are necessarily insincere. At least with the practitioners we evaluated, there appeared to be a quite sincere belief in their own paranormal abilities. It is perhaps this very sincerity, fueled by the seemingly consistent tactile validation experienced by both practitioner and patient, that makes Therapeutic Touch so convincing to both. Thus, we believe that our practitioners genuinely experienced the sensations but misattributed their source. An analogous phenomenon is found in Facilitated Communication, a largely discredited method of physically assisting nonverbal people with severe disabilities to type coherent messages. Facilitators believe they only support the person's hand without influencing key selection. Once again, there is strong evidence that a practitioner misattributes the source of a phenomenon (Jacobson, Mulick, and Schwartz 1995).

Some recent therapeutic evaluations of Therapeutic Touch have been performed, using the latest in high technology to rule out possibly confounding environmental factors (e.g., Bush and Geist 1992). However, we believe that high technology is both redundant and a blind alley when we focus on the most basic issue regarding Therapeutic Touch's validity. We ruled out disruptive environmental influences when our practitioners verified, prior to formal trials, that they could readily detect the presence and absence of energy emanations. If the practitioner cannot then proceed in fully blind trials to reliably detect the purported energy flow through the hands, he or she has no basis for claiming it as the foundation of diagnosis and treatment.

Unfortunately, the clear logic of experimental evaluation so evident in the work of the French commission is conspicuously absent in many of the agencies that support Therapeutic Touch in the United States (Scheiber and Selby 1997). Aside from the addition of modern statistical methods and a few simple experimental controls, we have little to add to the commission's original work. We endorse Gould's (1989) observation that:

> The logic of argument has a universality that transcends culture, and late Eighteenth Century debunking differs in no substantial way from modern efforts. The report of the Royal commission of 1784 is a masterpiece of the genre, an enduring testimony to the power and beauty of reason (p.16).

It appears that in contemporary America we have yet to catch up with eighteenth century science.

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Footnote

1. Any replication of this experiment would call for the development of a fully double-blind procedure. The practitioner, blindfolded, could, unaccompanied, follow a guideline to the orientation mat. The subject could follow a placement schedule known only to himself. Controls for auditory and olfactory cues could be added and the entire procedure videotaped with a preset camcorder. □

Paranormal Depictions in the Media:
How Do They Affect What People Believe?

Media depictions of the paranormal do seem to influence the way people think about the subject—but the connections are more complicated than you might think.

GLENN G. SPARKS

For nearly twenty years, I have been conducting research on the general effects of mass media, particularly the emotional effects of frightening movies and television programs on children. In the course of studying scary movies and television shows, it became apparent that many of them dealt with themes of the supernatural or the paranormal. For example, one movie that children found to be particularly terrifying was *Poltergeist.* In one of the classic scenes, a small child sits entranced by the static on her family's television set as she watches evil spirits shoot out of the screen and into her parents' bedroom, rocking the furniture like an earthquake. When *Poltergeist* was released, I was concerned about the film's emotional impact on children. It is now well documented that such films can dramatically elevate levels of

physiological arousal and induce a variety of post-viewing effects such as bad dreams, haunting images, fear of being alone, and the fear of going into certain rooms of a house (e.g., the basement or the attic) (Cantor 1994; Cantor and Sparks 1984; Sparks 1986; Sparks, Spirek and Hodgson 1993).

At the same time that I was busy documenting the emotional effects of movies like *Poltergeist,* I remembered a conversation from my days in graduate school with Dave Lindberg, a professor in the History of Science Department at the University of Wisconsin-Madison. Professor Lindberg encouraged me to begin investigating the impact of media depictions of paranormal phenomena on people's paranormal beliefs. Lindberg was concerned about the gullibility of many of his students and their easy, uncritical acceptance of the paranormal claims that were often disseminated through the mass media. I thought his idea was worth exploring, but at the time I was busy with my doctoral dissertation on children's fright responses.

In the early 1990s the time was right to begin studying what Lindberg had suggested. My casual observations of media content suggested an increase in "paranormal" content over the past several years. Programs like *Unsolved Mysteries* were routinely depicting people's encounters with UFOs, space aliens, and ghosts. Of course, the viewing audience was never actually presented with clear, compelling video evidence of these supernatural beings. Instead, viewers were typically supplied with dramatic recreations that certainly *looked* real and tended to capture the audience's imagination.

Viewers can turn the channel to witness dramatic testimonials about how psychics predict the future and change people's lives. Viewers are encouraged to call in immediately in order to speak with psychics and get their lives on the right track. Once I began to notice the prevalence of these themes, I concluded that they constituted a significant portion of daily television programming. Much of the skeptical literature (including many articles from SKEPTICAL INQUIRER) was filled with statements that *assumed* that the media depictions of the paranormal had great influence on the public. I found it curious that many of the same skeptics who insisted on rigorous empirical investigations in order to establish a claim about paranormal phenomena were oblivious to the absence of empirical evidence for their own claims of media impact of paranormal messages on the viewing public.

Searching the literature, I discovered almost nothing about the impact of paranormal media content on viewer beliefs. The citations were filled with studies of media violence—but there was almost nothing on paranormal content. Some theories of media impact might be extended to imply that the public will be affected by paranormal content in programs and movies, but until the empirical evidence on this point is well documented, we can't be certain. The lessons of science are quite clear that sometimes what seems like a reasonable assumption turns out to be wrong. I began to study this area.

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Although only five studies have been done to date on this topic, the current findings point in a consistent direction.

The first study: Disclaimers and Truth Claims

I started my investigation with a simple experiment that was inspired by a 30-minute entertainment series, *Beyond Reality,* that appeared weekly on one of the major cable television networks. Each episode featured a team of paranormal investigators who became involved in a particular paranormal incident. What initially caught my attention was the brief introductory tag that preceded the opening scene of each episode: "The following story of paranormal activity is based on reported incidents." I wondered about the impact of this tag in promoting belief in the sorts of events that were depicted. I also wondered how this tag might compare in impact with other tags that might be created. The complete description of the experiment I conducted with this program was published in the Summer 1994 SKEPTICAL INQUIRER (Sparks, Hansen, and Shah 1994).

About two weeks before the study's subjects came to the laboratory, college students completed a survey that included a brief inventory of their paranormal beliefs. When they reported to the lab, the subjects watched an episode of the program that depicted astral-projection (a person's spirit or soul leaving the body and traveling through space and/or time and then returning). One group watched the program without any introductory tag. Another group watched the program with a tag that was essentially like the one usually broadcast. We called this the "reality" tag. Two other groups watched the program with different disclaimers. One of the disclaimers said that the program was presented only for entertainment and was completely fictitious. The second disclaimer was even stronger—asserting that the depicted events violated the known laws of nature and that nothing like them had ever occurred. Finally, as a control group, some of the students watched an episode of a situation comedy that contained no references to anything paranormal. All groups were assigned randomly and were statistically equivalent on their pre-viewing beliefs in paranormal phenomena.

In a post-viewing inventory of paranormal beliefs, we found that the groups who saw either of the two disclaimers tended to express more doubt in the existence of paranormal phenomena. In contrast, the group who saw no tag at all tended to express more confidence in the existence of these phenomena. The differences were statistically significant and they were still present in a follow-up test that took place three weeks after the viewing session. Interestingly, the viewers who saw the "reality" tag showed no significant changes in their paranormal beliefs. We speculated that, perhaps, the display of this type of message may have caused viewers to think more about the veracity of the depicted events. Ironically, tags that tell viewers that the depicted events actually happened may in fact tend to promote more doubts. In any case, the results of this first study indicated that even a relatively small difference in a media presentation can potentially affect viewer beliefs. I

chose to follow up on this finding in a second study by examining another program and another presentation technique that is frequently used by television productions featuring paranormal themes.

The second study: Images of UFOs and Space Aliens

Unsolved Mysteries and similar programs dramatically and creatively use special effects in the re-enactment of stories. In the case of UFO reports, these stories typically contain colorful flying saucers and other strange craft that look very convincing. The narrators of these UFO recreations typically do not call attention to the fact that the stories are re-enactments. I wondered to what extent the inclusion of these dramatic sequences of UFOs might influence viewers to believe more in their actual existence.

I studied, together with my wife Cheri, a social psychologist, how these UFO images might affect the beliefs of people who tended to report that their mental images were very vivid. Would a person who had vivid mental imagery find the dramatic images of UFOs to be particularly compelling such that belief in UFOs would increase upon viewing? Or would such images be particularly influential for those low in vivid mental imagery, perhaps because they needed the images to really imagine the existence of space ships? The results of our study were published in the journal *Communication Research* (Sparks, Sparks, and Gray 1995).

To investigate the issue, we recruited participants for this study who were ranked either high or low in vivid mental imagery, according to a standard measure. We randomly assigned these participants to watch one of two versions of a popular network program that featured a series of UFO reports. In the first version, we showed the segment exactly as it had been broadcast—complete with the special effects of UFO images and space aliens that had been added by the producers of the program. In the second version, we carefully edited out all the footage that contained a UFO image and replaced it with scenes from the same broadcast (e.g., a flying UFO might be replaced with an empty sky). The audio portion of the segment remained identical. Steps were taken to assure that our editing looked reasonable enough so that naïve viewers never suspected that the segment had been changed. A control group watched a segment from the series about long-lost relatives who were reunited. This segment did not include any references to UFOs or paranormal phenomena. Just as they did in the first study, participants completed an inventory of beliefs several weeks before they arrived to view the program. After viewing was complete, we asked the participants to respond to questions about their beliefs concerning the UFO reports that were depicted in the program as well as their beliefs in UFOs in general.

One major finding that emerged from the study was that viewers who watched either of the two segments of the UFO reports increased their UFO beliefs significantly when compared to the control group. Like the results in the first study, this finding supports the notion that media depictions of the paranormal do indeed affect viewers' beliefs. We also found an interesting effect for vivid mental imagery. Those who were high on vivid mental imagery expressed *more* belief in UFOs than those who were low on vivid mental imagery—only when watching the version of the program that had been edited to remove all the UFO images. The two groups of subjects did not differ when they watched the unedited version of the program that contained UFO images.

The third study: The Role of Scientific Authority

News coverage of UFOs and alien abductions has been abundant over the past decade. Sometimes, a story is simply reported as if the events actually happened. Various testimonials are offered and the consumer is left to ponder the "facts." In other cases, a scientific authority is asked to comment on the story and to lend an opinion about the likelihood that the reported events actually occurred. This difference in news coverage might be important in affecting consumers' attitudes about the reported phenomenon. I chose to investigate this difference in the third study. The results of this study (Sparks and Pellechia 1997) appeared recently in an issue of *Communication Reports.*

Because I wanted to extend the research into the domain of printed materials, I chose to conduct this experiment using magazine articles. College students were presented with three news stories to read. One of the stories, based closely on an article that had actually appeared in a national magazine, reported that many people were making claims about being abducted by space aliens. This was the target story of interest. The two other stories were also real magazine articles on other topics, included to disguise the purpose of the experiment. In order to control for the possibility of order effects, the target story about alien abductions appeared equally often as either the first, second, or third story that the students read.

In preparing the target story about alien abductions, we varied the text of the article to create one of four different versions of the story. In the first version, the reports of alien abductions were generally affirmed as likely to have happened—but this affirmation was not clearly attributed to a scientific authority. In the second version, this affirmation was attributed to a scientist who had published some original research on the topic. In the third version of the story, the reported abductions were discredited as not very likely—but no scientific authority was cited. The fourth version of the story discredited the abductions as not very likely and cited a scientific authority for evidence. As a control condition, a fifth

story that was unrelated to alien abductions was given to a group of students.

After reading each of the stories, participants responded to questions about their attitudes and beliefs pertaining to the story content. In the case of the UFO story, these questions focused upon belief in UFOs and alien abductions. The major finding to emerge was that greatest level of belief in the existence of UFOs and alien abductions was found in the group that had read the story in which these reports were affirmed by a scientific authority. The level of belief in this group was significantly greater than that found in the control group and in either of the groups who read stories containing no reference to any scientific authority. Interestingly, the version of the story in which a scientific authority discredited the reports of alien abductions did not result in significantly lower UFO beliefs. In fact, in terms of rank order, belief in UFOs in this condition was second only to the condition in which a scientist affirmed UFO beliefs. While the reason for this finding is not entirely clear, it may be that simply mentioning a scientific authority in a story about space aliens tends to lend some credibility to the topic—regardless of what the scientist actually says. This possible effect should be explored in future studies. Once again, however, the data from the third study tell us that generally speaking, the way in which a news story presents information about these phenomena can certainly affect the attitudes and beliefs of the news consumer. I decided to follow up this investigation with a parallel one using footage from a broadcast news program.

Media depictions of paranormal events do appear to influence the ways in which people think about such claims.

The fourth study: The Importance of Balance

CBS television devoted a full hour of its April 20, 1994, weekly investigative news show *48 Hours* to the existence of UFOs and alien abductions. This program provided a unique opportunity to work with news material that had actually been broadcast, and I considered this advantage to compensate for the fact that I couldn't manipulate the footage quite as precisely as I typically do in experimental studies. Within the hour-long broadcast, there were several shorter segments that focused on different aspects of the UFO phenomenon. One of these segments reported the alleged events of the UFO crash in the desert near Roswell, New Mexico. This segment essentially reported testimony from "eyewitnesses" who all told stories supporting the notion that a real spaceship with alien bodies had been recovered by the U.S. government. During the entire 6-7 minute report, no information contrary to the version of the story related by these eyewitnesses was given. It was a one-sided presentation. In contrast, a different segment of the broadcast featured a two-sided presentation regarding UFOs. The report focused on a group who made regular visits to the desert of Arizona to record UFOs on videotape. One of these recording sessions was shown and the alleged UFO was clearly seen. Subsequent to the testimony of several group members that this really was a space ship, the network's staff was shown consulting with film and videotape analysts about the video image that was recorded. The experts used computers to enhance the image and concluded that it was very likely a conventional jet aircraft. They also noted that the place where the footage was filmed was a scant forty miles from a major metropolitan airport.

In an experiment, I randomly assigned college students to watch one of these two segments from the news program. Like some of the other experiments, UFO beliefs were measured several weeks before exposure to the program and again immediately after viewing. The results of this study (Sparks, Pellechia, and Irvine 1997) were presented at a recent conference of the Broadcast Education Association, but have not yet been published. As expected, a very strong difference emerged between the two viewing groups. The group that viewed the one-sided segment about the alleged Roswell coverup increased their UFO beliefs by several points on a UFO-beliefs scale designed for this experiment. In contrast, the group that viewed the two-sided segment decreased their UFO beliefs almost as much. The probability that these differences emerged by chance was less than one in 10,000. Of course, it is possible that the one-versus two-sided nature of the news segments was only one of many differences in the two presentations that contributed to the differences in beliefs. But, once again, the results of this study point in the same direction as the others. Having documented these effects in the laboratory, I wondered whether similar evidence would appear using a different research methodology.

The fifth study: The Role of Personal Experience With the Paranormal

In this study, I investigated the relationship between media exposure and paranormal beliefs using a random sample survey. Although this method is limited in terms of documenting clear evidence for a causal relationship between exposure and belief, I thought it was important to see if the general pattern of findings that emerged in the first experimental studies could be duplicated using a very different research methodology. The results of this study appear in a recent issue of the *Journal of Broadcasting & Electronic Media* (Sparks, Nelson, and Campbell 1997).

Using a random-digit dialing technique, we interviewed 120 adults of Lafayette, Indiana. We asked a series of questions about general media exposure, exposure to specific programs with paranormal themes (*Unsolved Mysteries, Sightings, The X-Files, The Psychic Connection*), and paranormal beliefs. A number of interesting findings emerged.

First, like other random sample surveys, the respondents in

our sample expressed widespread belief in a variety of paranormal phenomena. For example, more than 40 percent of the sample expressed belief in haunted houses and more than 30 percent reported that, using ESP, they could sometimes tell what another person was thinking about.

Second, the data showed that paranormal belief is multidimensional. That is, people may express belief in some aspects of the paranormal, while disbelieving in others. Our sample appeared to distinguish between at least two types of paranormal belief: belief in supernatural beings (e.g., ghosts, devils, space aliens) and belief in psychic energy (e.g., ESP, astrology, levitation, etc.). Belief in the two dimensions was significantly correlated, but shared less than 15 percent of the variance in common.

Third, while no significant relationship emerged between exposure to general television programs and paranormal beliefs, such a relationship did emerge between exposure to the *paranormal* programs and paranormal beliefs. There were several contingent aspects to the relationship. It held only for the supernatural beings factor—not the psychic energy factor. And it held only for people who reported no prior experience with a paranormal event. It is not difficult to speculate about the underlying reasons for these findings. A great deal of the most dramatic and most watched paranormal material on television tends to deal with supernatural beings (ghosts and space aliens) instead of psychic energy. And for someone who reports no personal paranormal experiences, television may constitute the only source for information and representations in this area. Consequently, these individuals may tend to rely more on television to suggest what they should believe about this realm. In contrast, those who believe they have had personal paranormal experiences may find media messages to be a far less important source of information about the topic.

This analysis is highly speculative and more research needs to be done on these issues. Will Miller and I have just completed a second random sample survey of 200 respondents in which we will be following up on many of these findings. Of course, it is possible to interpret the relationship between viewing and beliefs as indicating that people who believe in the paranormal tend to watch paranormal programs more than those who don't. I am currently designing a study that tests this selective exposure hypothesis directly. Nevertheless, the findings from the survey data are certainly not inconsistent with the results found in the experiments. It may be that the relationship between viewing and beliefs is bi-directional.

Conclusions

I emphasize again the tentative nature of the findings from these five studies. Rather than some definitive picture on the nature of media effects in this domain, I regard these studies as only a beginning hint of the media impact of paranormal depictions. Science thrives on replication and sustained efforts to challenge research findings that seem to be firmly established.

Even though the results must be viewed with caution at this point, media depictions of paranormal events do seem to influence the ways in which people think about paranormal claims.

In addition to this general conclusion, I would underscore several other important points:

Typical of any area of media effects, there are individual differences in reactions to media messages about the paranormal. For example, the fifth study provides a hint that one's perceptions of a personal experience with the paranormal realm may be important in understanding the impact of media messages of this type.

Many important questions about the nature of media impact in this realm remain unanswered. In the next year, I plan to undertake a major study of media impact on the paranormal beliefs of children. There are good theoretical reasons to suppose that children are more vulnerable to messages of paranormal events—but the supposed impact has yet to be studied systematically.

Individuals interested in promoting critical thinking skills and careful scrutiny of paranormal claims should note the potential power of the media to hurt *and* help the cause. Certain types of messages may promote paranormal beliefs. But the flip-side is that other types of messages may help to promote critical thinking and to discourage easy acceptance of ridiculous ideas. The findings in the first study clearly support this conclusion.

The impact of paranormal depictions in the media on paranormal beliefs should never be asserted without scientific evidence. To do otherwise is to fall prey to the same flaw that many seek to criticize in others. Often, the loudest critics of those who accepted various claims without adequate evidence were the same ones who spoke loudly and confidently about the impact of the mass media on paranormal beliefs—even though not a single shred of evidence for that claim was ever presented.

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Planting a Seed of Doubt

Skeptics should forego any thought of convincing the unconvinced that we hold the torch of truth illuminating the darkness. A more modest, realistic, and achievable goal is to encourage the idea that one may be mistaken. Doubt is humbling and constructive; it leads to rational thought in weighing alternatives and fully reexamining options, and it opens unlimited vistas.

ELIE A. SHNEOUR

Theodore Newton Vail (1845–1920) was twice president of the pioneering U.S. Telephone company, as the Bell Telephone Company (1878–1887) and again as the American Telephone and Telegraph Company (1907–1919). The story of his life and accomplishments is an extraordinary one, and not relevant to this essay, with but one exception. During his early tenure as president of the telephone company, Vail assembled his management staff to analyze and answer one central question: *What is our business?*[1]

It would seem pretty obvious that the business of a telephone company is communication by telephone. But not for Vail. In fact, answering that kind of a question is perhaps one of the most difficult issues an organization has to ponder, and the right answer to it is far from obvious. Vail's answer was crucial, and its implementation ensured the survival and prosperity of a major American firm for more than three quarters of a century.

Vail's answer to the question "What is our business?" was *"Our business is service."* Although that answer becomes self-evident as soon as it is uttered, it is in its implementation that its importance is truly acknowledged. When Vail articulated it, the U.S. telephone system was already an anomaly: All telephone companies worldwide were generally nationalized because they were monopolies. And AT&T, like them, was at considerable risk of being nationalized in its turn.

The second part of the answer is more subtle than the first. In order to stay in private hands, the telephone company had to be assured of political support. And ultimately that support had to come from individuals and their communities. In order to achieve that goal, Vail undertook to install telephone lines in all areas, including isolated rural communities, which at the time made no immediate economic sense. But it was an immense service that generated exceptional customer satisfaction. And all of Vail's employees were constantly admonished to emphasize service above all.

Gerald Fried

The third part of conceptual implementation was to recognize that telephone service was as yet relatively primitive, and had a long way to go, needing extensive and sustained improvements. This required emphasis on research and technology, whose flagship became the Bell Telephone Laboratories, the fountainhead of many major inventions that have transformed our lives, including the transistor. Several of these accomplishments, however, are little known to the general public but are of at least equal importance to the invention of the transistor.

In 1931, for example, Bell Telephone Laboratories hired a young M.I.T. graduate, Karl Jansky, and assigned him to find the sources of all the causes of noise in telephone lines. Jansky spent several years on this work, and meticulously identified all sources of noise but one. He eventually demonstrated that this last source of noise originated beyond the earth, and thus was born the science of radioastronomy.

And all of these favorable consequences, including the political decision of Franklin D. Roosevelt's administration to leave AT&T in private hands, arose directly and indirectly from Vail's inspired understanding that the business of his company was service, and doing something equally inspired about it.

This brings us at last to the question, What is the business, or more properly the mission, of the Committee for Scientific Investigation of Claims of the Paranormal (CSICOP)? Surely, it is far more all-encompassing than debunking UFOs, the Bermuda Triangle, the Loch Ness Monster, health nostrums, astrology, creationism, and the whole ever-expanding gamut of misleading, outlandish, and fraudulent claims made in the name of science. And the right and apt answer to "What is CSICOP's mission?" is likely to have a host of long-term favorable consequences in the same way that Vail's answer had for the fortunes of AT&T, many of them unknowable at the time his answer was suggested and implemented.

Those of us who have been speakers on the regional and national media circuits know in our collective guts that no matter how articulate, witty, disarming, and convincing we may be, in the last analysis we change very few minds. And that is being optimistic! The rest of the time, when we are not preaching to our collective choirs, we converse knowingly with each other, reading our articles and books, and meeting at our conferences, deploring the sad state of affairs beyond our ken. And no one has yet collected James Randi's legendary $10,000 (now more than a collective million-dollar) challenge.

The result is that despite the impressive progress CSICOP and its satellites have made since its founding, collectively we remain a series of small islands of rational thought in the vast ocean of scientific illiteracy. Many reasons have been advanced

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over the years for this continuing state of affairs.

The polygraph is still being used and widely advertised as a proven method of detecting lies. Astrology columns without CSICOP's disclaimer still abound in periodicals across the country. National television networks still broadcast nonsense about creationism and perpetual motion machines. Roswell, New Mexico, is still a mecca of UFO buffs. If anything, the sheer volume of these and many other myths persist with a commercial vengeance. Billions of dollars in revenue sustain the purveyors of fraud and fairy tales.

By contrast we skeptics have to pinch pennies, put our pitiful fingers in the dikes, and try, without much success, to outshout some sense over the cacophonous clamor. The sad truth is that we cannot possibly compete on an even playing field against this collectivity. We are not likely to do so until science is properly taught in our schools, and until those informed students graduate as writers, editors, publishers, and network executives, promoted through the ranks. This is not likely to happen in our lifetimes, but in the meantime we cannot afford to stand still. We have to fight the good battle regardless of the odds. And I believe that we can make a difference.

Ultimately it is our benevolent credibility rather than whatever political clout we may possess that will make the difference.

The first and foremost criterion of enhanced effectiveness is to devote more time to the uninformed collectivity, and decrease the time speaking to ourselves. We perhaps should focus on the decision makers at the local, regional, state, and federal levels. An excellent model for this is the valiant Eugenie C. Scott and her National Center for Science Education, which advances the cause of evolutionary science in response to the creationist threat. But this still leaves the fundamental issue, the reason for this essay, unanswered.

The premise is that no matter what we do and how we do it, we are unlikely to convince enough well-meaning and intelligent people that rational thought is the very foundation of our society and that scientific knowledge has given us the tools to enhance the quality of our lives. But we should perhaps purposefully forego the goal of convincing the unconvinced that we hold the torch of truth illuminating the darkness. We may not think that this is what we are, in fact, attempting to do. But across the chasm that separates the skeptic from the convinced, we too often come across as the self-righteous proselytizer. And in the welter of messages that constantly assail us from every quadrant, a society where fifteen-second sound bites rule, ours is often diminished, laughed away, adulterated, defamed, or ignored, if not lost altogether.

Ultimately it is our benevolent credibility rather than whatever political clout we may possess that will make the difference. And the first step toward that enhanced credibility is to lower our expectations. Most people stand in firm defense of their convictions, because in today's world, where it is difficult to believe anything, there is comfort and safety in holding onto a core of beliefs, whatever their rational merit. *"Give me the benefit of your convictions, if you have any, but keep your doubts to yourself for I have enough of my own,"* wrote Goethe. Of course, education is intended to equip every sentient human being with two fundamental tools for coping with the other social animals of his tribe: The first is the communication tool of reading, writing, counting, and knowing the tribe's history and traditions. The second is the rational thinking tool, without which the first tool cannot effectively be applied.

It is the thinking tool that CSICOP is primarily concerned with. It is inevitable that some of the facts and concepts we absorb as children are either perishable or damaged goods, yet persist into adulthood. Adults are better equipped to filter that intellectual bounty, but the price paid is that established convictions are rapidly carved in stone.

And CSICOP has chosen to challenge some of these unshakable convictions for what it views as the betterment of society. The rational fulcrum of this process is the scientific method, whose power in the affairs of men is difficult to denigrate. If the reader has any doubt on this score, he is invited to try to identify a twentieth century philosopher who has had more drastic impact on our daily lives than a twentieth century scientist such as Albert Einstein.

In the face of this intellectual brick wall of given convictions and scientific illiteracy, what can CSICOP accomplish in a reasonable time with the limited resources at its command? Or, even if CSICOP had these resources multiplied by ten, a hundred, or even a thousand times? The answer is, very little, if the goal is to refashion the given convictions into rational ones. But there is another way to approach the problem, stated witheringly by Oliver Cromwell in a letter he wrote to the General Assembly of the Church of Scotland on August 5, 1650: *"I beseech you, in the bowels of Christ, think it possible you may be mistaken. . . ."*

". . . Think it possible you may be mistaken . . ." is exactly what CSICOP ought to aim for as its ultimate goal. *To plant a seed of doubt* into an unwavering conviction is a vast accomplishment in education as well as in thinking on one's own. To be able to doubt is humbling and constructive because it requires the application of rational thought in weighing alternatives. Once that seed has been planted, it can germinate into a full reexamination of the options, which opens unlimited vistas, or it can remain a dormant seed. In either case, the process cannot help but enrich each human being and make him or her a more effective and a more balanced member of a better society.

To have accomplished this remarkable feat would be the ultimate accolade for any organization. It is within the scope of what CSICOP can achieve, and in all humility, it ought to aim for that attainable goal.

Note

1. Peter Drucker, *Management: Tasks, Responsibilities, Practices.* Harper's College Press, N.Y. (1977) □

Essiac: The Not-So-Remarkable Cancer Remedy

Essiac and Essiac-like products generate millions of dollars in sales annually. They also generate multitudes of excuses for their failure to show any effectiveness in scientific tests.

LYNN McCUTCHEON

Excuse-iac: an excuse offered to explain any of the many failures of Essiac under controlled conditions, or to explain the unusual behavior of those who make claims about its ability to cure cancer.

Talking a Good Game

Suppose you know someone who brags incessantly about his ability to play professional basketball. After listening to this bold chatter for some time, you pull some strings and arrange for a tryout with the Chicago Bulls. Your acquaintance is generally belligerent and uncooperative with the Bulls coaching staff. Worse yet, he can't shoot and he can't play defense. Following this humiliation you expect him to slink out of the gym in complete silence. To your surprise he offers bizarre excuses for his failure. "The rim was not at regulation height," he says. "The floor was too slippery."

Your loquacious friend soon begins clamoring for a new

tryout with a different team. The bragging continues unabated until you arrange for a tryout with the New York Knicks. Again he performs miserably, and again instead of keeping his mouth shut he produces a new set of excuses. "My socks didn't fit right." "It was too hot in the gym."

Bolstered by some apparent successes on the playground against inferior competition, he acquires a few believers who are willing to sing his praises and finance his trips to major cities for additional tryouts. Los Angeles, Toronto, Atlanta, Houston—he performs poorly everywhere he goes. The excuses sound increasingly weird with each failure. "My fingernails were too long." "Subconsciously I had bad vibes in Atlanta." "In Houston the electrons in the atmosphere from the space program interfered with my jump shot." The last you heard he was back on the playground, still telling everyone how great he is.

When challenged, proponents of dubious remedies provide excuses instead of evidence.

A Caisse History

This allegorical tale parallels the Essiac saga. In 1922 a nurse from Ontario, Canada, René Caisse, was given a secret Indian formula for "curing" cancer. She began administering it to a few people alleged to be suffering from cancer and soon opened a clinic. Some of the patients survived and helped her spread the word that Essiac ("Caisse" spelled backward) was nothing short of miraculous. Since nurses are not permitted to practice medicine in Canada she eventually was called before the Ontario Cancer Commission. Given the opportunity to present any evidence that Essiac was a bona fide cancer fighter Caisse was unwilling or unable to produce a single well-controlled study. Instead, she opted to present a large number of people who claimed to have been helped by Essiac. The Commissioners were not fools. They understood the weaknesses of substituting testimonials for scientific research. The American Cancer Society (*Questionable Methods* 1993) has pointed out several reasons why we should all be wary of testimonials:

1. Some patients might have been misdiagnosed, a possibility that seems especially likely in rural Canada in the 1930s. These patients simply never had cancer.

2. A cancer was cured or put into remission by conventional therapy, but Essiac was given credit.

3. The cancer was progressing in some who testified, but they were symptom-free at that point, so they believed that they had been cured.

4. Those who used Essiac and died or did not find it helpful did not testify. Since we know that she treated thousands of cancer patients (Moss 1992) this might well have been a very large silent majority.

In December of 1939 the Commission issued a report recommending against the legalization of Essiac. In so doing, it cited the first two reasons mentioned above, and it also noted Caisse's refusal to divulge the formula (Thomas 1993). The Commission wanted to conduct scientific studies that Caisse had been unable or unwilling to perform, but without the formula this would have been difficult. Caisse had bungled the first major opportunity to show that Essiac worked. It was at this point that Caisse and other supporters of Essiac began to develop the first of what became a long series of "excuse-iacs." The first excuse-iac was that Essiac was denied legalization because the government was prejudiced. "If only the government would stop persecuting us," they cried. It has become standard fare for nearly every dubious remedy that has promised much, but under careful scientific scrutiny has delivered little.

The second excuse was more interesting. Caisse refused to divulge the formula because she was afraid the government would take the ingredients away from her. This excuse-iac might have seemed plausible at the time, since no one knew the formula. Today, we know that Essiac consists of four herbs, burdock, rhubarb, sheep sorrel, and slippery elm, all of which are common to Ontario. In retrospect this excuse seems puzzling, since it is difficult to imagine how the government could take away something that grew wild throughout the region.

The Commission, impressed jointly by Caisse's popular support and the seeming harmlessness of Essiac, allowed her to continue operating her clinic. This should have given her ample time to either conduct the quality research that would have impressed the authorities or arranged for scientists to do it for her. She stubbornly opted for neither, all the while maintaining that Essiac had already proven itself.

The clinic was shut down in 1942, but her biographer tells us that Caisse continued to give Essiac occasionally to those who requested it until her death in 1978. In 1975, perhaps realizing that time was running out, she approached Memorial Sloan-Kettering Cancer Center and asked if it would test Essiac. Essiac was tested in the S-180 mouse sarcoma test system. Six immunotherapy tests and two chemotherapy tests using the samples sent by Caisse showed no activity.

The excuses were flying before the study was even complete. According to Caisse, the serum was improperly prepared, and some of the reports allegedly came from another lab (Thomas 1993). These two excuses were blatant attempts to make Sloan-Kettering appear to be incompetent. No one is perfect, but Sloan-Kettering enjoys an excellent reputation as one of the top cancer clinics in the world, according to Dr. Jane Gibson, herself a cancer researcher with the prestigious M.D. Anderson Cancer Clinic. It seems unlikely that either of these two excuse-iacs are valid.

Caisse also argued that a *human* carcinoma should have

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been implanted in the mice. Caisse has been portrayed by her supporters as an expert on cancer research. However, according to Gibson (1997), it is difficult to get human tumors to grow in mice. Surely a real expert on cancer research would have known that.

Essiac Lives On

When Caisse died someone had to take on the task of explaining Essiac's failures. That responsibility fell into the very capable hands of her admiring biographer, Mr. Thomas (1993). Years after the fact, two additional excuses have been employed by Thomas to explain the first Sloan-Kettering failure. The first is that the sample she sent consisted of only one of the four herbs. Secondly, that sample was alleged to be twenty-five years old at the time it was sent. Thomas offered no evidence that Caisse actually did do something so obviously counterproductive to her own cause, but admitted that these actions seemed puzzling. He suggested that maybe subconsciously she had no intention of cooperating with the medical establishment.

This would seem to be a high water mark for excuse-iacs. Five different excuses to account for one failure, some of them showing considerable imagination. There were more excuse-iacs to come, but never with the same flair and panache as this set.

Shortly before her death Caisse sold the Essiac rights to the Resperin Corporation. Resperin's president apparently believed that he could win governmental approval and eagerly sought the research support needed to do so. In 1982, Resperin sent a liquid sample of Essiac to Sloan-Kettering for a second round of tests. Essiac was tested in several "animal leukemia and solid tumor test systems in seventeen separate chemotherapy experiments and no antitumor activities were found in any of these tests" (*Unconventional Cancer Treatments* 1990, 74).

At about the same time Canadian authorities were conducting a retrospective study involving human patients. The Bureau of Human Prescription Drugs had a list of 150 physicians from all over Canada who had requested Essiac on behalf of their patients. (It was the Bureau's policy to provide Essiac to patients who requested it through their physicians.) The Bureau wrote letters to each physician asking for a detailed medical history of each patient who had used Essiac for any substantial length of time. Data from eighty-six patients were analyzed by the Bureau.

The conclusion was that forty-seven of them obtained no benefit from Essiac, seventeen died, and for eight of them the reports were too ambiguous to categorize. Five patients required fewer pain killers, four showed an "objective" improvement, one showed a "subjective" improvement, and four were in "stable condition." These numbers alone added up to another failure for Essiac, but the extent of that failure was not evident until the Bureau requested additional information on the four "stable" patients and the four who had shown "objective" improvement. Of these eight, three were later found to have had progression of the disease, two had died, and three were still in "stable" condition. The three "stable" patients had previously received conventional cancer

Brad Marshall

treatment, which, according to the Bureau, was probably responsible for their "stable" condition (*Unconventional Cancer Treatments* 1990).

One of the excuses given to account for these two failures was essentially the same as before, namely that the Resperin Corporation was incompetent (Thomas 1993). Specifically, the batches of Essiac were said to be nonuniform. It is difficult to imagine how Thomas would have known this—he did not claim to be a chemist or to be personally involved with the sale or distribution of Essiac. Even if we assume that he was right this would not necessarily account for Essiac's failure. Minor deviations from the "correct" formula would probably not affect the test results very much.

Since the Bureau of Human Prescription Drugs is an arm of the Canadian government, the old reliable "persecution" excuse-iac was reinvoked for that study. Because that study involved a large number of doctors from all over Canada, the possibility of some sort of conspiracy to make Essiac look bad seems remote. The idea of systematic bias against Essiac creeping into the Bureau's interpretation of the eighty-six reports seems only slightly more likely. If the Bureau really wanted to be dishonest why didn't it "find" that Essiac failed in all eighty-six cases?

In 1983, at the request of the Canadian government, Resperin sent a liquid sample of Essiac to the National Cancer Institute (NCI). The results of NCI's tests in the mouse lymphocytic leukemia P388 tumor system showed no antitumor

activity (*Unconventional Cancer Treatments* 1990). NCI also tested each of the four ingredients in Essiac several times and found nothing of value. It did find lethal toxicity in some of the highest concentrations given to the mice. It is unclear how the concentrations used in these tests might relate to those typically given to human patients.

The excuse offered for this failure was that the author was unable to find out anything about the details of the study. I was much luckier than Mr. Thomas. I called NCI's 800 number and was put in touch with the Natural Products Branch. A few days later I received a phone call from Dr. Gordon Cragg, the head of that branch. He assured me that the constituent plants in Essiac had been tested against various tumor systems, and that "none showed significant activity worthy of further study" (1997). He even sent copies of some of the lab reports free of charge.

Convincing Scientific Evidence?

One of the companies currently marketing an Essiac-like product sent me a few abstracts from some legitimate scientific journals as part of its advertising. In one of them (Morita, Kada, and Namiki 1985) a substance isolated from burdock was found to suppress mutagenic activity in a test tube. Since most mutagens can cause cancer, this sounds like burdock can prevent cancer. In another abstract Dombradi and Foldeak (1966) found that burdock was useful in suppressing tumors injected into laboratory animals. In yet another abstract sheep sorrel was found to greatly inhibit the growth of Sarcoma 180 solid tumors in mice (Ito 1986). This research suggests that cancerous tumors can be wiped out using sheep sorrel.

Taken as a whole, these three studies seem to vindicate Rene Caisse and her many supporters. Were all the experts wrong and this backwoods nurse right all along? Is it time to break out the Essiac and drink a toast to all those who spread the word about its miraculous curative powers? No, according to several cancer research experts I talked to.

Dr. Robert Marsh, an oncologist at the M.D. Anderson Cancer Clinic in Orlando, Florida, pointed out that there are many chemical compounds that suppress mutagens in test tubes. He estimated that, for a variety of reasons, less than one out of a hundred of them would have any value against cancer in the human body (1997). The factor isolated from burdock by Morita et al (1984) had a high molecular weight, which, if taken in tea, would make it difficult to survive the digestive process to affect a cancer cell. Dr. Jane Gibson told me that studies with animals are only slightly more impressive than test tube studies (1997). Dr. Barry Schweitzer, Division Director at the Walt Disney Memorial Cancer Institute, mentioned that animal data don't necessarily extrapolate to human beings (1997), and Carol Coyne, who is a Clinical Research Coordinator at M. V. Anderson, agreed (1997). Furthermore, Gibson said that the particular mutagens used in the Morita study rarely cause cancer in humans. In the Ito study the dose of sheep sorrel extract that was most effective was 100 milligrams per kilogram. It is quite likely that such a dose is much stronger than that found in Essiac. Raising the concentration in Essiac might appear to be a solution, but increasing the concentration, according to Carol Coyne, also increases the chances of toxicity (1997). Finally, Gibson raised the point that these studies are all at least eleven years old. She suggested that the researchers may have abandoned this line of research because it led to nothing useful.

Where Are We Today?

Currently there are several companies marketing Essiac-like products. Presumably they are all slightly different from each other, but all claim to be the "best." And just what does it mean to be the best? Apparently nothing! A representative from one of them admitted to me (off the record, of course) that there are no studies comparing the various Essiac-like products, and that his company was not interested in conducting such a study. The exact formulas used by each company remain closely guarded secrets.

There is still a remote possibility that Essiac or some of its components might have some limited value in treating or preventing some forms of cancer. A series of well-designed and well-executed studies would prove or disprove that possibility.

Seventy five years after Rene Caisse was given the secret formula, we now have a proliferation of secret formulas, a plethora of excuses, and *still* no convincing evidence that any of them are effective against cancer when taken orally by humans. In the meantime, its supporters continue to claim that it is ". . . the best cancer preventative one can ever hope for," and that its effectiveness has been ". . . verified by available research" (*Herbal Essence* 1996, 3).

There are basketball players who can "talk" a good game and there are cancer "cures" that promise much. There are basketball players who can't really perform very well and there are cancer "cures" that don't perform well either. Until the performance rises to the level of the talk you might do well to ignore both.

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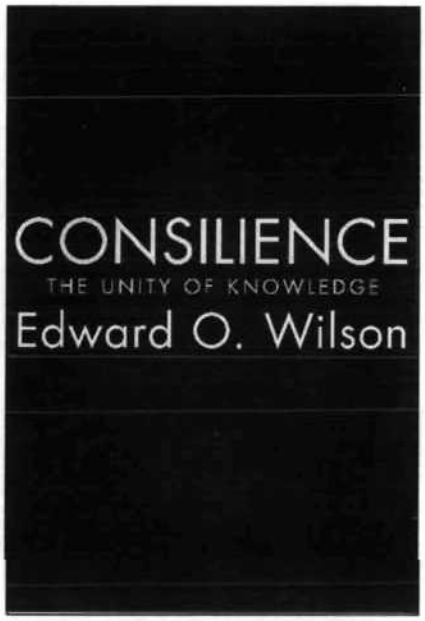
Can the Sciences Be Unified?

PAUL KURTZ

Consilience: The Unity of Knowledge. By Edward O. Wilson.
Alfred A. Knopf, New York, 1998. ISBN 0-679-45077-7. vii + 322 pp. $26.

In this bold and provocative book, E. O. Wilson sets himself ambitious goals: He seeks to defend the sciences against the forces that would undermine their integrity, to integrate knowledge across the disciplines and branches of knowledge, and to apply this knowledge for human betterment.

His first task is eminently reasonable. Although the sciences have made impressive strides in understanding nature and human nature, the scientific enterprise has suffered considerable forays against it from a wide range of critics. There is today a concerted effort from many sides to deprecate science and to minimize its achievements. Here Wilson is not referring simply to the growth of belief in the paranormal and the pseudosciences or of fundamentalist religion, but the challenge of a bevy of postmodernist deconstructionists, cultural relativists, ecofeminists, Afrocentrists, neo-Marxists, philosophical Feyerabendians and Kuhnians and Latourian social constructionists. These critiques emanate from the academy—predominantly from the faculties in the humanities, the arts, and the social sciences—where they have had considerable influence. They add up to the pessimistic appraisal that the sciences express no more than "narrative myths" and that their findings are no truer than any other areas of human endeavor. Indeed, we are told that the modern quest for objective methods of knowledge is a chimera. Subjectivists and nihilists today denigrate



science and blame it for most of the problems that the world faces. In essence, the postmodernist critics of science are attacking the Enlightenment thinkers of the seventeenth and eighteenth centuries and their conviction that it was possible to discover knowledge of the real world and apply it for human improvement. The goal of the Enlightenment, says Wilson, was " to demystify the world and free the mind from the impersonal forces that imprison it" (p. 21). Now that is under attack by extreme postmodernist skeptics.

Wilson forcefully defends the Enlightenment, which, he maintains, needs to be recaptured and realized, and he agrees with Condorcet (the last of the *philosophes* of the eighteenth century and one of his heroes) that scientific knowledge can make the most powerful contributions to human progress. Science is not a "social construction" (a view held by the influential French sociologist Bernard Latour), though it is conditioned no doubt by the societies in which we live; and the methods of science have enabled us to extend our knowledge dramatically. Indeed, since the Enlightenment science has increasingly expanded the frontiers of knowledge and this has led to the industrial and technological revolutions and the subsequent massive changes that have occurred in world civilizations ever since.

Wilson's second task is likewise reasonable, but far more difficult to achieve. He believes that there is a genuine need to unify knowledge. This he calls *consilience*, borrowing the term from the nineteenth-century English philosopher of science William Whewell. It means, literally, a "jumping together" of knowledge by the linking of facts and theories across disciplines in order to create a common groundwork of explanations.

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Wilson properly points out the quandary that we face today. Scientists and scholars can make progress only by the most intense concentration in their specialized disciplines and fields of expertise. If they are to be recognized by their peers and to succeed in their professions, they must make original contributions to knowledge; but this usually means a narrowing of focus, as demanded by the division of labor. This does not permit them much time for dallying in other fields—they can always be accused of dilettantism; nor, regrettably, do they have much inclination to popularize their ideas or interpret them for scientists in other fields or for the general public. E. O. Wilson is a notable exception in this regard, for not only has he made original contributions to research in his own field of entomology (the study of insects), but he displays encyclopedic knowledge and consummate literary skills that have earned him two Pulitzer prizes and enable him to write for a wider public outside of his own specialty.

Wilson's important contributions to sociobiology two decades ago raised a howl of protests from environmentalists, who deplored his emphasis on the genetic conditions of behavior, and from some skeptics who thought that the theoretical constructs of sociobiology had not been empirically tested. Today the intellectual tide has shifted from environmentalism to genetic explanations, and more in Wilson's favor.

Consilience involves a good deal of philosophical reflection. Wilson correctly perceives that although specialization has been effective in extending the frontiers of knowledge, there has been an increasing fragmentation of knowledge so that authorities in the various domains of knowledge are often ignorant of what others have discovered; nor is anyone able to piece together this knowledge in any coherent way. Yet, if the scientific enterprise is to be fully understood and developed, we need to point out the complementarity of the separate disciplines and indeed the convergence of explanations of many of them. Regretfully, although most people welcome the scientific breakthroughs and technological achievements of the present day, their own cosmic outlook is more readily drawn from religion, the humanities, politics, or the arts, rather than the sciences. Scientific illiteracy is widespread, even among the educated classes, and especially among politicians and the leaders of industry. Colleges and universities no longer provide undergraduates with an integrated liberal-arts curriculum in which the sciences play an important role, but instead they offer up a smorgasbord of courses and programs from which students cherry pick in terms of their tastes and preferences.

Wilson believes that we must attempt consilience anew, given the great progress in recent decades in many of the sciences, and he offers his own generalized account of what this should include.

The task of unifying the sciences has largely been abandoned by philosophers today. Although the logical positivists a half century ago (Carnap, Reichenbach, and others) attempted to unify knowledge, they did so on the basis of logical analysis alone, says Wilson, but our ignorance at that time of how the brain worked limited their efforts. Ludwig von Bertalanffy also attempted to achieve a unity of the sciences, based on systems theory.

Wilson believes that we must attempt consilience anew, given the great progress in recent decades in many of the sciences, and he offers his own generalized account of what this should include. He readily concedes that this is metaphysical. Yet in his defense, his conceptual framework is not merely speculative, but is grounded in empirical generalizations and interpretations based on the sciences; though they clearly need further experimental verification.

Wilson argues that the natural sciences provide a basis for integrating our knowledge in a way that was not possible in the past, and that these explanations draw upon a reductionist model, which is essentially naturalistic and materialistic. We are now able to draw together a web of causal explanations proceeding from physics and chemistry to biology. Thus, quantum mechanics is the basis of atomic physics, and this is the foundation of chemistry, biochemistry, and molecular biology. These explanations proceed step by step; and explanations of higher levels of organization even on the cellular and organismic level depend upon more fundamental explanations on the micro level.

From the standpoint of the human species, Wilson maintains that the most important concept is that the brain is the basis of the mind and that every mental event has a physical grounding. In the past decade, discoveries have enabled us to integrate our knowledge of human behavior, especially the brain sciences (cognitive neuroscience), behavioral genetics, evolutionary biology, and environmental science. Of crucial significance is the role of evolutionary theory in interpreting knowledge: the human brain evolved by means of natural selection and is an instrument of survival. Scientific inquiry has attempted to transform the brain from its original instrumental survival function to one of understanding nature in its own terms. Our understanding is now enhanced, he believes, because principles of universal rational consilience are provided by the natural sciences.

What is apt to be Wilson's most controversial thesis, and is doubtless open to skeptical critiques, is his effort to integrate not only the natural sciences, but the social sciences and the humanities. This he attempts to do by integrating culture within the context of evolution. For the evolution of the human species,

the unique factor that has emerged is gene-culture co-evolution; in addition to the genetic-biological determinants of behavior, there are cultural changes that modify the environment and the processes by which the human species evolved. Culture allows humans to rapidly adjust to changes in the environment, and these adaptations are transmitted to successive generations by custom. Wilson attempts to integrate levels of discovery with conceptual frameworks that include the natural sciences, genetics, biology, anthropology, sociology, economics, and the social sciences. He maintains that genes prescribe epigenetic rules, and these channel the acquisition of culture; culture in turn helps determine which genes survive and reproduce in breeding populations. Human nature for Wilson is not within the genes per se, "It is not the genes, which prescribe it, or culture, its ultimate product. Rather, human nature . . . is the epigenetic rules, the hereditary regularities of mental development that bias cultural evolution in one direction as opposed to another, and thus connect the genes to culture" (p. 164).

Wilson offers a schematic interpretation of how the humanities—the arts, ethics, and religion (he is a skeptic about the claims of religion)—could in principle come within the domain of natural science explanations. This is the most speculative aspect of his thesis, and we have a long way to go before this is achieved. The influential American philosopher Richard Rorty denies that the unification of knowledge is desirable, but he seems in turn to reduce science to literary metaphor and to have abandoned rigorous methods of scientific inquiry entirely.

Does Wilson's conceptual schema succeed in tying together knowledge on many levels of organization, or are we not still at the level of pluralistic principles of explanations from several sciences—far short of the reductionist goal, yet on the path to integration? We surely should still attempt to work out a comprehensive reductionist model, even if we have not fulfilled the reductionist ideal fully. Clearly reductionism has been a valuable research tool, perhaps the most valuable heretofore discovered; we should no doubt continue to use it as a methodological device wherever we can. I think that in principle all phenomena are reducible to their physical-chemical constituents. Yet at the same time it is important that we continue to pursue holistic explanations for more complex systems of organizations, particularly in psychology and the social sciences where we need to deal with phenomena encountered in the contexts under analysis. I have elsewhere labeled this approach "coduction." Here we coduce explanations, drawing on many sciences. For example, it is difficult, without an overall comprehensive set of explanations, to know how an economist can deal with market phenomena by knowing brain chemistry alone, or a sociologist can interpret systems of social value by reducing them to the laws of physics and biology—not that we should not continually try wherever possible for reductionistic explanations; they will no doubt be discovered and be useful. But these may not provide the whole picture of who and what we are or how we behave. Thus we have a more complex account drawn from many levels of inquiry, and this is still a thoroughly naturalistic account.

Given these caveats, we should welcome Wilson's valiant efforts in *Consilience*—for he provides a positive view of the possible reaches of scientific inquiry. There is so much in this insightful book that I have not touched upon. Many of his claims need further critical scrutiny. Some skeptics will no doubt reject many of Wilson's speculations as unwarranted. In my view we should not ignore the efforts of scientists such as Wilson to seek comprehensive explanations of the universe. Many of the obstacles placed in the path of scientific inquiry in the past have been overcome. Almost at the same time that critics have denied the possibility of knowing this, that, or something else, new sciences have been hatched dealing with these areas.

We should encourage generalists such as Wilson who have the demonstrated virtuosity to take one step beyond the confines of specialization, and offer some coherent picture of what the sciences tell us about the universe. I agree with Wilson that we should try to unify our knowledge. Scientific consilience has advantages over literary, aesthetic, philosophical, or theological attempts at unity. At least these theories can be tested, for they presuppose a common intersubjective world.

Wilson's final task in *Consilience* is to apply scientific knowledge to normative questions. He concludes his book with an ethical platform and plea. He is concerned about environmental degradation, the loss of biodiversity, and the long-range consequences of continued ecological damage to the human species and other forms of life on the planet. He maintains that scientific understanding of how we evolve and an awareness of possible future dangers is essential if we are to avoid irreparable damage to our common global habitat. At a time when many scientists are reluctant to engage in any kind of ethical recommendations, Wilson argues effectively, I think, that we ought to use the scientific knowledge that we have in order to develop wiser social policies. Wilson believes that we should not consider science to be entirely value-neutral, but that we should draw upon the best knowledge available in order to formulate our judgments. (I have suggested the term *eupraxsophy* to mean that we can and should use scientific wisdom to develop good practice.) We should not leave such issues to the wielders of economic, political, or clerical power alone, but should attempt to bridge the divide between scientific disciplines, and to provide some normative help in resolving important ethical and social problems. Thus, some generalized coherent view of what we know about nature and the place of the human species within it is not only intellectually interesting, but it has direct relevance to our ethical values.

Science and Religion in the Narrow Scope

A. SCOTT HENDERSON

Summer for the Gods: The Scopes Trial and America's Continuing Debate Over Science and Religion. By Edward J. Larson. Basic Books, New York, 1997. ISBN 0-465-07509-6. 318 pp., hardcover, $25.

Edward J. Larson, the author of two previous books, continues his inquiry into modern attitudes toward science with an engaging account of the 1925 Scopes "monkey trial" in which high school biology teacher John Scopes was accused of breaking a Tennessee law that forbade the teaching of evolution. Larson is a professor with a joint appointment in history and law at the University of Georgia. Though other books have been written about this sensational event, Larson's account, based on new archival material, is the most authoritative study to date. (Just days after this review was submitted, *Summer for the Gods* was awarded the 1998 Pulitzer Prize for History.)

Larson's narrative is logically organized into three sections that detail events before, during, and after the trial. Larson's prose is lively and fast paced, especially his description of the trial itself, which pitted two well-known protagonists against each other: the Populist and inveterate presidential candidate William Jennings Bryan, who assisted the prosecution, and the folksy, acerbic lawyer Clarence Darrow, who defended Scopes.

Larson's account begins with a brief overview of developments in twentieth-century paleontology. In two subsequent chapters, he contrasts Bryan's political philosophy with the evolving views of the American Civil Liberties Union (ACLU). Larson correctly frames this section within the larger debate over majoritarian rule versus individual liberties. Bryan, like many Americans, believed that the majority had the right to dictate (read: legislate) whatever set of moral or ethical standards they desired. This included the right to determine curricula in tax-supported schools. The ACLU, whose origins lay in WWI-era free speech and academic freedom cases, had a different set of concerns. The ACLU argued that antievolution laws violated freedom of religion by forcing the state to teach the biblical version of creation. Phrased differently, in places like Dayton, Tennessee (the trial's venue), civil rights advocates emphasized the rights of the unpopular minority over those of the popular majority. Given the streak of religious intolerance that had characterized American history, this would prove an uphill battle.

Larson correctly points out that Bryan, unlike Tennessee's antievolution legislators, did not want to eliminate evolution from school curricula entirely; he simply wanted it taught as a theory, not a fact. Had Bryan's version of majoritarianism triumphed, there might not have been a trial at all. As it was, little philosophical or legal middle ground was left in which to compromise.

Larson's treatment of the trial illuminates another important theme. Rather than a direct clash between "religion" and "science," the trial was really more about two different schools of religious exegesis that had emerged by the turn of the century. So-called "fundamentalists" embraced infallibility and a literal interpretation of biblical scripture. Fundamentalists were especially numerous in the rural South, which is one reason Tennessee led the way in passing an antievolution law (taking the Bible literally, establishing a divine, not natural origin of mankind). An opposing perspective was put forward by "modernists," many of whom were located in the larger cities and divinity schools of the Northeast and Midwest. Modernists advocated a more theologically flexible approach to interpreting scripture, an approach they hoped would allow Christianity to meet the changing needs of contemporary, "modern" individuals. For Darrow, the testimony of modernist theologians was essential for illustrating that evolution and scripture were not, as fundamentalists asserted, in conflict (for example, modernists argued that the biblical "day" might have been longer than twenty-four hours). Though this tactic was unsuccessful (Scopes was eventually convicted), it nevertheless illustrated how modernists attempted to assimilate developments in the natural and social sciences, while fundamentalists saw such accommodations as nothing less than apostasy.

The final section of Larson's study is perhaps the most interesting. Larson skillfully reconstructs the mythology that arose—and still exists—concerning the trial. Due to the influence of popular and scholarly accounts, the "trial of the century" came to represent a decisive defeat for religious fundamentalism (the trial's verdict notwithstanding). Larson judiciously points to Frederick Allen Lewis's *Only Yesterday: An Informal History of the Nineteen-Twenties* and Jerome Lawrence and Robert E. Lee's play *Inherit the Wind* (which was subsequently made into a film) as the chief culprits. For Larson, the myth created by these works—the notion that religious fundamentalism was and is largely relic of the past—is inaccurate and misleading. Larson persuasively argues that fundamentalism, far from being impotent, has continued to enjoy widespread support in certain regions of the country. Furthermore, for the past two decades fundamentalists have wielded increasing influence over partisan politics and policy.

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In an otherwise comprehensive study, the only disappointment is the relatively scant attention paid to "creation-science." Though not entirely avoided, a fuller treatment of this topic could have illuminated how the terms of debate have shifted over what constituted "true" religion (fundamentalism versus modernism) to contemporary arguments over what comprises "real" science (creationism versus evolution). Readers of this journal in particular would be interested in such an analysis. Nonetheless, this is only a minor blemish. Anyone interested in the tension created by the interaction of religion, science, and public policy should read this book. The issues it raises are as important today as they were in the 1920s.

Talking to Heaven—Who's Answering?

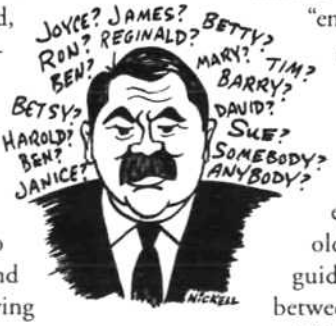
JOE NICKELL

Talking to Heaven. By James Van Praagh. Dutton, New York, 1997. ISBN 0-525-94268-8. 194 pp. Hardcover, $22.95.

Enjoying best-seller status for a time this spring—number one on the *New York Times* booklist—James Van Praagh's *Talking to Heaven* revives an old claim. Van Praagh claims that he and certain other "spiritualists" can communicate with the dead. Unfortunately, the author neglects to mention that the history of modern spiritualism has been a history of deception.

As many skeptics well know, its very founding in 1848 was a fraud. Spiritualism sprang to life in upstate New York with the rappings and alleged spirit contacts of two teenage girls known as the Fox sisters. Soon the young girls' performances captured international attention, prompting similar claims by mediums across the world. Only forty years later, with her sister Katie looking on, did Margaret Fox publicly demonstrate the tricks the schoolgirls had used in pretending to communicate with a ghost.

Despite spiritualism's checkered history of hoaxes and trickery, Van Praagh endorses the genuineness of such phenomena as spirit photography, "apports" (magically appearing items), "ectoplasm" (a substance allegedly exuded from a medium's bodily orifices), and even luminescent "materializations" of spirit entities. Alas, one must look elsewhere to find evidence of the double-exposed pictures and other tricks, the hiding places where apports were stashed until needed, the evidence that ectoplasm's "gauzelike" quality (as Van Praagh characterizes it) was due to phony mediums using cheesecloth for the purpose, and the reports of those who embraced the "spirits" and discovered them to be living persons in ghostly guise.



The record of such trickery, if not the actual risk of exposure, has caused many spiritualists to avoid physical phenomena. Despite his endorsement of their authenticity, when it comes to his own practice, Van Praagh is strictly a "mental medium," one who uses "psychic ability" that includes alleged clairvoyance (or inner sight) and clairsentience (extrasensory feelings).

Such an approach makes it difficult for an investigator to distinguish between two types of deception: that involving the deliberate hoodwinking of the sitter and that in which the medium and sitter essentially deceive themselves.

Psychologists know, for example, that the "voices" allegedly heard by mediums are invariably their own internal thoughts, that they glean information—innocently or shrewdly—by familiar means. These include reading body language (to sense when one is factually on or off track), providing data in question form (which may, if correct, be considered a "hit," but otherwise will seem an innocent query), and inviting the sitter to interpret the vague statements offered. (Van Praagh often asks, "Do you understand this?" or "Do you know what this means?" or similar questions, inviting the sitter to provide the meaning. If the sitter does not comprehend, the medium will try another tack.)

Van Praagh manages to cast discredited spiritualism in a new light: He utilizes popular belief in every type of alleged ghostly activity (flickering lights, dreams, "meaningful" coincidences, and the like), not just séance phenomena. He takes advantage of New Age popularity to include "chakras" (purported "energy centers"), meditation, psychic phenomena, and so on, but presenting everything in a religious rather than occult context. For example, he equates the old mediumistic "spirit guides" (supposed go-betweens with the "other world") with "guardian angels," thereby tapping into the currently faddish interest in angels.

His major ploy is the book's title, *Talking to Heaven*, which suggests that spirits of the dead exist not in some ethereal dimension, as earlier spiritualism implied, but in a traditional religious domain. Everyone, Van Praagh would say, can talk to Heaven. But one is reminded of the exchange in Shakespeare's King Henry IV between Glendower and Hotspur. When the former boasts, "I can call spirits from the vasty deep," the other replies, "Why so can I, or so can any man; But will they come when you do call for them?"

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Computers, Emotions and Innocence

JULIA L. GREEN

HAL's Legacy: 2001's Computer as Dream and Reality. Edited by David G. Stork. Foreword by Arthur C. Clarke. Cambridge Mass.: MIT Press 1997. 384 pp. Hardcover, $25.

I remember seeing the film *2001* for the first time in 1969, at a Boston movie drive-in, in the back of my parent's station wagon. As I recall, my brother and parents fell asleep, and I stayed up and watched Kubrick's and Clarke's vision of an interstellar future. Now, as a very failed scientist and a somewhat successful artist, I read with some sadness Stork's dedication at the beginning of this interesting and visually beautiful book, "To Stanley Kubrick, *Ars sine scientia nihil est.*" "Art without knowledge is nothing." As Stork and other authors in this book point out, we arrogantly predicted HAL in a movie, but have yet to actually invent him. In some ways, Artificial Intelligence such as the chess-playing Deep Blue and the computer psychologist ELIZA have come close, but we have yet to invent a machine that can actually learn and feel emotion with the depth of a human being.

David Stork is a cognitive psychologist. With his colleagues, he takes apart the 1960s fascination with computer-like characters like *Star Trek's* Mr. Spock and HAL, and says in essence that no machine is as brilliant as a human memory or emotion. But we have come close, if only as a result of our striving for brilliance and desire to excel.

The book is peppered with pictures from *2001*, charts and graphs comparing the voices and movements of HAL and humans, showing us how far we have come and how far we still have to go. Daniel C. Dennett's last chapter takes us back to the time we invented the computer and discovered atomic physics, and asks "When HAL Kills, Who's to Blame? Computer Ethics." For those of you unfamiliar with the movie, HAL disconnects astronaut Frank Poole from his life-giving tether and pushes him out to space and death in a cold void.

Raymond Kurzweil points out that we have been able to create computers that talk with inflection, but not with emotion, that can parse a sentence perfectly and logically, but cannot master the nuances of slang and grammar that we learned in our first 12 years of schooling. In an interview with Stephen Wolfram, Stork and Wolfram discuss the popular educational math software Mathematica, and how it was distributed before HAL's fictional 1997 birthday. The book even devotes a chapter to the possibility of a computer that can lip-read as HAL did in the film.

Four of the chapters are Dr. Stork's, the remaining by science and film experts such as Arthur C. Clarke, Marvin Minsky, Murray S. Campbell, Joseph Olive, Roger Schank, Douglas Lenat, Rosalind Picard, and Raymond Kurzweil. Each chapter after the first takes an attribute of HAL, as he functioned in the movie, and asks "Could we do this now?" Stork's and his colleagues' answers are a resounding, No.

The book asks intriguing questions about the distinctions between human and computer. Various attributes of what it means to be human are broken down and analyzed; Can computers mimic humanity, and if so, to what degree?

Azriel Rosenfeld asks, Can a machine see? Well, not as we can. It may see a numerical array of pixels, but not be able to make sense of it. Can a machine talk with emotion? Well, we have created the computerized voice, but still cannot invent the inflection that makes it humanly responsive. There are humanistic chapters such as Rosalind Picard's "Does HAL cry Digital Tears? Emotion and Computers." When Dave, the last astronaut aboard, figures out HAL has cut Frank Poole adrift, he disassembles his last friend in the universe. HAL, we find, has a fear of death or at least of non-existence. He pleads sadly for Dave not to disassemble him. Douglas Rain, the actor's voice behind HAL, brilliantly portrays a fear of discontinuance that is both terrified and without feeling at the same time.

Murray Campbell writes that we got the chess thing right. The ordeal of chess master Kasparov, who was finally beaten by Deep Blue, is discussed. Alan Turing also wrote a computer chess program, the book mentions, even before he invented a computer. HAL plays chess with human style and insight, even a mistake now and then. Deep Blue merely computes all possible moves of his opponent, no accounting for human error.

What is our fascination with the computer anyway? Stork and his colleagues ask. As Arthur C. Clarke reminds us in the foreward, the first computers were built for warfare in the 1940s. The Z-3 by Konrad Zuse in Nazi Germany, the Mark I by U.S. Navy Commander Howard Aiken, and the Robinson and Collossus computers by Alan Turing and his English colleagues are all examples. Stork and his associates suggest in this darkly entertaining book that perhaps the roots of the Computer Revolution were not so innocent.

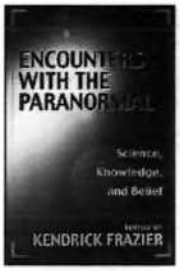
After reading this book, I think back to that innocent time in 1969, when 2001 seemed very close and our HAL and mission to Jupiter were not yet here. Perhaps the year, as in George Orwell's *1984*, was not really the point of their predictions. If art without knowledge is nothing, as the Latin saying goes, perhaps it is because their relativity is derived equally from the human imagination. □

Julia Green is a freelance writer and programmer.

NEW BOOKS

Cognitive Science and the Mind-Body Problem. **Morton Wagman.** Praeger Publishers, 88 Post Road West, Westport, CT 06881-5007. 1998. ISBN 0-275-96031-5. 169 pp. Hardcover, $59.95. A scholarly examination of the centrality of the mind-body problem within and across the science of cognition—from philosophy to psychology, artificial intelligence to neural science. The author is professor emeritus of psychology at the University of Illinois at Urbana-Champaign. He was honored as Distinguished Psychologist by the American Psychological Association in 1990. This is the latest in a series developing intellectual grounding for establishing foundations and implications of a general unified theory of human and artificial intelligence.

Encounters with the Paranormal: Science, Knowledge, and Belief. **Edited by Kendrick Frazier.** Prometheus Books, 59 John Glenn Dr., Amherst, NY 14228-2197. 1998. ISBN 1-57392-203-X. 426 pp. Softcover, $22.95. Forty-six chapters by 45 authors exploring issues and questions along the tumultuous interfaces among science, knowledge, and belief. This latest collection of articles from the SKEPTICAL INQUIRER includes Carl Sagan's "Science and Wonder," Leon Lederman's "A Strategy for Saving Science," Paul Kurtz's "The New Skepticism," Martin Gardner's "Science vs. Beauty?" James Alcock's "The Belief Engine," Anthony Pratkanis's "How to Sell a Pseudoscience," Susan Blackmore's "Near-Death Experiences," Evan Harrington's "Conspiracy Theories and Paranoia," Elizabeth Loftus's "Remembering Dangerously," and thirty-seven others, many with author postscripts updating and commenting on reaction. Other topics include psychic spying, quantum quackery, polygraph tests, subliminal perception, antiscience in the universities, and satanic-cult rumors. Organized into sections on Science, Imagination and Responsibility; Science and Antiscience; Science, Pseudoscience, and Pathological Science; Pseudoscience and Pathological Cults: Heaven's Gate; Science and the Psychology of Belief; Psychology and the Claims of Psi; Psychology and the Anomalous Experience; Social Dynamics and Belief; and the Malleability of Memory.



Why Science? **R. Stephen White.** Nova Science Publishers, 6080 Jericho Turnpike, Commack, NY 11725. ISBN 1-56072-531-1. 228 pp. Hardcover. A collection of columns over the past two years from the *Santa Barbara News-Press* intended for the millions of science teachers, students, and the public "who want evidence for their views." The author laments the general neglect of mainstream science, the purveyors of pseudoscience, and the "prophets of doom" in the media. Columns are grouped into seven sections: Superstition and the Paranormal, Science and Antiscience, Medical Science, The Environment, Energy Science, Basic and Applied Science, and Science Education. The author was for twenty-five years a professor of physics at the University of California, Riverside, and director of its Institute of Geophysics and Planetary Physics.

ARTICLES OF NOTE

Augustine, Norman. "What We Don't Know Does Hurt Us: How Science Illiteracy Hobbles Society." *Science,* 279:1640-1641, March 13, 1998. "Science and Society" essay explores the apathy and disdain toward science in the U.S. and other countries. Author propounds Augustine's Second Law of Socioscience (and engineering): "For every scientific (or engineering) action, there is an equal and opposite social reaction. He says we need more courses on "Rocket science for beginners," and scientists must learn to communicate far more effectively with nonscientist audiences.

Ernst, Edzard. "Beyond Reasonable Doubt." *New Scientist,* April 18, 1998, p. 49. Forum column notes that while complementary/alternative medicine (CAM) has triumphed in terms of public support, its scientific progress has been slow. He refers to the "quackery, pseudoscience, and antiscience" that hovers about it and says practitioners must welcome solid scientific evaluations. "Evidence-based CAM must not remain a contradiction in terms. The efficacy, safety, and costs of CAM should be scrutinized just as in other fields of medicine."

Hotz, Robert Lee. "Divining the Brain's Role in Spirituality." *Los Angeles Times,* April 26, 1998, pp. A1, A30. Lengthy, well-researched report by a science reporter into the new ability of biomedical and behavioral researchers to probe the neurobiology of religious experience in search of scientific perspective. *Is there a biochemistry of belief?* Does religion require a soul? Does science allow one? Such questions were long the province of theologians and philosophers, but they arise anew "from a remarkable flowering in the study of the biology of behavior."

Lauerma, Hannu, and Matti Tuliharju. "Neurological Motor Disorders Experienced as Religious Phenomena: Role of Abnormal Movement Monitoring." *Brain and Cognition* 36: 52-56, 1998. Authors describe two cases of neurological motor disorders that were experienced as religious-mystical phenomena by elderly psychotic women. One felt that the left and right sides of her body had changed places; she interpreted this as divine good and bad forces controlling her body and forcing her to try to kill her friends. The other felt that her tardive dyskinesia, an orofacial movement, was the voluntary reading of a silent mantra. The authors say involvement of mystical or religious terms in interpretation of physical symptoms may lead to poor treatment and care. They suggest that a psychosis-related inability to monitor one's own motor behavior is the crucial factor leading to "peculiar perceptions of motor disorders."

Loevinger, Lee. "The Significance of the Millennium." *Interdisciplinary Science Reviews,* 22 (4): 343-351, 1997. A longer version of the author's article of the same title published in the January/February 1997 SKEPTICAL INQUIRER.

Monastersky, Richard. "Courting Reliable Science." *Science News,* 153: 249-251, April 18, 1998. Article on how judges are seeking to improve use of scientific experts in trials.

Polidoro, Massimo, and Gian Marco Rinaldi. "Eusapia's Sapient Foot: A New Reconsideration of the Feilding Report." *Journal of the Society for Psychical Research,* 62 (850): 242-256, January 1998. Considers whether all of the phenomena presented by the medium Eusapia Palladino during her

1908 Naples séances could have been produced without the help of secret accomplices. The authors suggest that her ability to free her limbs via "substitution," the psychological conditions during the séances, and the gullibility of the three 1909 "Feilding Report" experimenters were enough to account for the phenomena. They also examine the psychological aspects of the deceptions apparently perpetrated by Eusapia and give a few suggestions for how better controls might have helped in avoiding being deceived.

Rosa, Linda, Emily Rosa, Larry Sarner, and Stephen Barrett, M.D. "A Close Look at Therapeutic Touch." *Journal of the American Medical Association,* 279 (23): 1005-1010, April 1, 1998. This paper generated a flurry of worldwide publicity in early April. The reason is that second-author Emily Rosa is an 11-year-old sixth-grade student in Loveland, Colorado, and she designed and conducted the tests. The test attempted to determine whether the hypothesized "energy fields" implicit in the practice of Therapeutic Touch (TT) can really be detected by the practitioners. According to this paper, the study found that 21 experienced practitioners of TT, when blinded, were unable to tell which of their hands was in the experimenter's "energy field." The mean correct score was close to what would be expected for random guessing. The report concluded that "TT claims are groundless and that further use of TT by health professionals is unjustified." Although the effort and the outcome are welcomed by those skeptical of TT and its energy fields, the study is not without shortcomings. For a detailed critique, see the article "The *JAMA* TT Article Critiqued" by Carla Selby and an editorial by Bela Scheiber, both in the March/April 1998 *Rocky Mountain Skeptic.*

Soren, David. "The Tabloid Touch." *Archaeology,* March/April 1998, p.96. Ever wonder what's behind some of the weird articles about supposed archaeological discoveries ("Goliath's Skull Found in Holy Land") that appear in the supermarket tabloids? Archaeologist Soren tells his story of how a photo of his discovery of skeletons of a young man and woman killed in an earthquake in the ancient Roman city of Kourion on Cyprus, in A.D. 365, came to be published in the *Weekly World News* under the headline, "Adam & Eves Skeletons Found—In Colorado."

Teresi, Dick. "Monster of the Tub." *Discover,* April 1998, pp. 87-92. Article about the supposed Lake Champlain monster gives a lot of space to a natural explanation proposed by three Middlebury College scientists for the frequent sightings of something. It turns out that the lake, like Loch Ness in Scotland, is prone to massive subsurface seiche's—standing waves—that churn up the lake bottom and cause logs and vegetation to surface periodically. Also quotes CSICOP's Joe Nickell on that and on "psychological contagion" (people who look for monsters tend to see them) and *SI* contributor Michael Dennett, who notes that, like Bigfoot, "There is a monster sighting for almost every body of water."

Wilson, Edward O. "Integrated Science and the Coming Century of the Environment." *Science* 279: 2048-2049, March 27, 1998. This is a good time to acknowledge that science is no longer the specialized activity of an elite, nor a philosophy, nor a belief system, writes Wilson. "It is rather a combination of mental operations, a culture of illuminations born during the Enlightenment four centuries ago and enriched at a near-geometric rate to establish science as the most effective way of learning about the material world ever devised." And it is available to all. One of the five defining traits of science, he says, is "consilience," the interlocking of causal explanations across disciplines. Within the natural sciences there is now a webwork of established cause and effect that traverses vast scales of space, time, and complexity, a web now widened to some forty orders of magnitude. He foresees an ever greater linkage between the two great branches of learning—the natural sciences and the social sciences and humanities—with emphasis on central questions on the linkage between genetic and cultural evolution. (See book review, this issue, page 47.)

—Kendrick Frazier

SCIENCE BEST SELLERS

Top Ten Best Sellers in **San Francisco**

1. ***The Biotech Century***
   Jeremy Rifkin; J.P. Tarcher
2. ***Consilience***
   Edward Wilson; Knopf
3. ***The Meaning of it All***
   Richard Feynman; Addison-Wesley
4. ***Guns, Germs and Steel***
   Jared Diamond; W.W. Norton
5. ***Life: An Unauthorized Biography***
   R Fortey; Knopf
6. ***The Cambridge Quintet***
   John Casti; Addison-Wesley
7. ***How the Mind Works***
   Steven Pinker; W.W. Norton
8. ***Einstein's Miraculous Year***
   John Stachel and Roger Penrose
   Princeton University Press
9. ***Living Downstream***
   Sandra Steingraber; Addison-Wesley
10. ***Song for the Blue Ocean***
    Carl Safina; Henry Holt

By arrangement with *New Scientist* magazine, May 1998. See Planet Science at **http://newscientist.com** for more reviews. Some books also available at the Planet Science Shop.

Is Science Concerned with Truth?

RALPH ESTLING

Mention the word *truth* to most scientists and they become nervous, twitchy, then dismissive and distinctly irritable. Truth, they will most likely reply, in a serious, no-nonsense, huffy and puffy way, is a subject for philosophers to argue over (Murray Gell-Mann has a doctor's prescription strictly forbidding him from engaging in philosophical debates). Truth is a metaphysical term, or, far worse, a theological one. It is not a concern of scientists, who will quickly change the subject, if you let them.

If you insist on pursuing the matter they will say that, far from being an exercise in truth-gathering, science is a search for tentative, partial, possible aids and abetments in the eternally ongoing quest for knowledge. It is a search for prosthetic devices to assist the brain in its unsure groping toward external realities, to be discarded as soon as better temporary aids come to hand. The literary or romantic among them will explain patiently that science is a relentless Becoming, never final, never complete, a traveling hopefully, never an arrival. And so on, depending on the extent and intensity of their protests.

They protest too much, too insistently. They are too afraid of appearing immodest, and one can see why. Science is already chastised as a new religion and scientists as its high priests by a wide range of critics, from followers of Thomas Kuhn to deconstructivists. For science has become too successful. To remedy this situation, its detractors the sociologists, philosophers, and historians of science—those who know everything about science, except what it is— turn to spite and postmodernism. Scientists hunker down to escape the flak and, crouching low, disclaim that their work has any connection with truth.

There is an understandable moral cowardice in this, but it is unjustified and, at heart, inexcusable.

Of course science is a creation by humankind, and we are fallible. Of course science is a cultural artifact reflecting its time and place. How could it be otherwise? We do not need the relativists to tell us this.

But, though science does not seek The Truth, it does indeed seek truths, and the truths of science are unlike social truths and unlike moral truths. Within human societies there is always great need for pluralism and tolerance. Science, however, is not a social or a moral truth, it is not a way of bringing disparate ideas together, harmoniously, peacefully, democratically. Science is not pluralistic, nor is it tolerant.

In science, pluralism and tolerance will imperceptibly fade into relativism, where there is no such thing as external truth, objective facts, intrinsic, self-sustaining reality, where there is only "my truth" and "your truth." There is never any need to compare, contrast, question, doubt, argue, seek to learn from what the data say and what the Universe tells us. When this happens, truth—for there is such a thing—is in dire peril. And science ceases to function.

This is the opposite extreme from the fanatic, the person who is certain he is in possession of The Truth. Each extreme, that of the fanatic and that of the relativist, is deadly, for it can tear civilization apart, the one where There Is No Truth, the other where not only is there Truth but *I* Am in Possession of It, and therefore *You* had better watch out!

What is truth? said jesting Pilate, not staying for an answer. The linguistic philosopher Alfred Tarski replied that "it is all that is the case," it is "analogous to the function of *true* in ordinary language." (In other words, truth is what happens to be true.) This, we are informed, is a "semantical theory of truth." I begin to suspect that Gell-Mann's doctor is a wise man.

Perhaps we can do better. Perhaps we can say truth is what is out there, whether we know it to be there or not. We have nothing to do with its creation, but if we are diligent and careful, and perhaps lucky, we can discover truth, bits and pieces of it. Other philosophers believe truth is to be found if we sit very still and think very deeply about it.

Sitting still and thinking is not in and of itself a bad thing, it is what the

Ralph Estling writes from Ilminster, Somerset, U.K.

philosophers like to call "necessary but insufficient," for there is also the pressing need to go out and look, to experiment, observe, collect and make some sense out of the information with which we are in some danger of being drowned, once we open the floodgates of empiricism.

The empirical approach is, as we all know, the scientific approach, and there is nothing particularly new or thrilling about it. It was put forward as a system by David Hume 250 years ago, and even he harbored dark doubts about it. It tells us that what was true about external phenomena is likely to remain true—likely but not certain. This is because external phenomena obey deeper truths, truths we may not know of. Hume went on to argue, in a troubled frame of mind, that just because the sun had risen every morning for countless eons, that is no guarantee that a morning will not come some day when it does not rise. We even know, as Hume did not, that such a morning will indeed come some day, though not for a few billion years yet. This very knowledge of Earth's doom, sad though it may be (for one half of it will inevitably fry as surely as the other half inescapably freezes), is what gives the lie to both fanatic and relativist.

For it will happen. Whatever the fanatic or relativist proclaims to be "the case" it will happen. It will happen because: 1) truth is external to man; and 2) truth exists. Fanatic and relativist can shout and stamp and proclaim all they wish. The day will come when the Earth's rotation and revolution will be the same duration. The truth is out there (sorry, relativist) and not in us (hard luck, fanatic), it may or may not make us free. In fact it is more than likely to make us very uneasy, for we realize we cannot control it, cannot bend it to our will, cannot make it conform and perform to our little likes and dislikes, and it does not give a damn. It is sovereign. And it does not need us to tell it what it is and what it must do. Science tells us this.

And this is why fanatic and relativist, the one who is certain he holds truth in his clutches and the other who is just as certain that everyone holds it in his and in her clutches and each one clutches a different thing, are jealous of and angry with science and would destroy it if they could. For it tells them both they are not only fools, but impotent fools. And so if they cannot destroy this terrible message they can at least destroy the messenger, the bearer of ill-tidings, the truth-bringer, science and all its works.

And what does our noble truth-seeker, the scientist, say to all this? He says, What has science to do with truth? I have my petri dishes and my statistical tables to tend to. Don't bother me with trifles and philosophy.

The truth is not trifling nor is it a philosophic point for pre-Socratics and post-moderns to conjure with. Science may be a reflection of our age, but if it is good science it is something far more. Truth is not a relative measure for each of us to make in our inertial frame of reference. It is what is out there.

If the fanatics and the relativists wish to ignore the truth that is out there, let them. Perhaps we all are in need of Gell-Mann's doctor's prescription. But when scientists deny that their work involves what is true, what is the real state of things, then what does science become except an elaborate, intricate game, one to be played or put away in the closet, whichever we choose.

We have no such choice, there is no such game. And we had better stop fooling ourselves that there is.

Change the Channel

KAT MELTZER

Reincarnation: brought to you by the same earnest folk who remind you to "Be here now."

Still it's satisfying to think that the yutz who didn't want to miss his exit so he cut across three lanes without signalling, missed you by a foot, drove up the embankment to the road, then flipped you the bird, may one day return as a lowly slug and get eaten by a scrubjay.

And who couldn't use a second chance? A friend once told me "When I come back, I'm going to be a dolphin. I want to be sleek and have a blowhole." Well, yes. Who wouldn't?

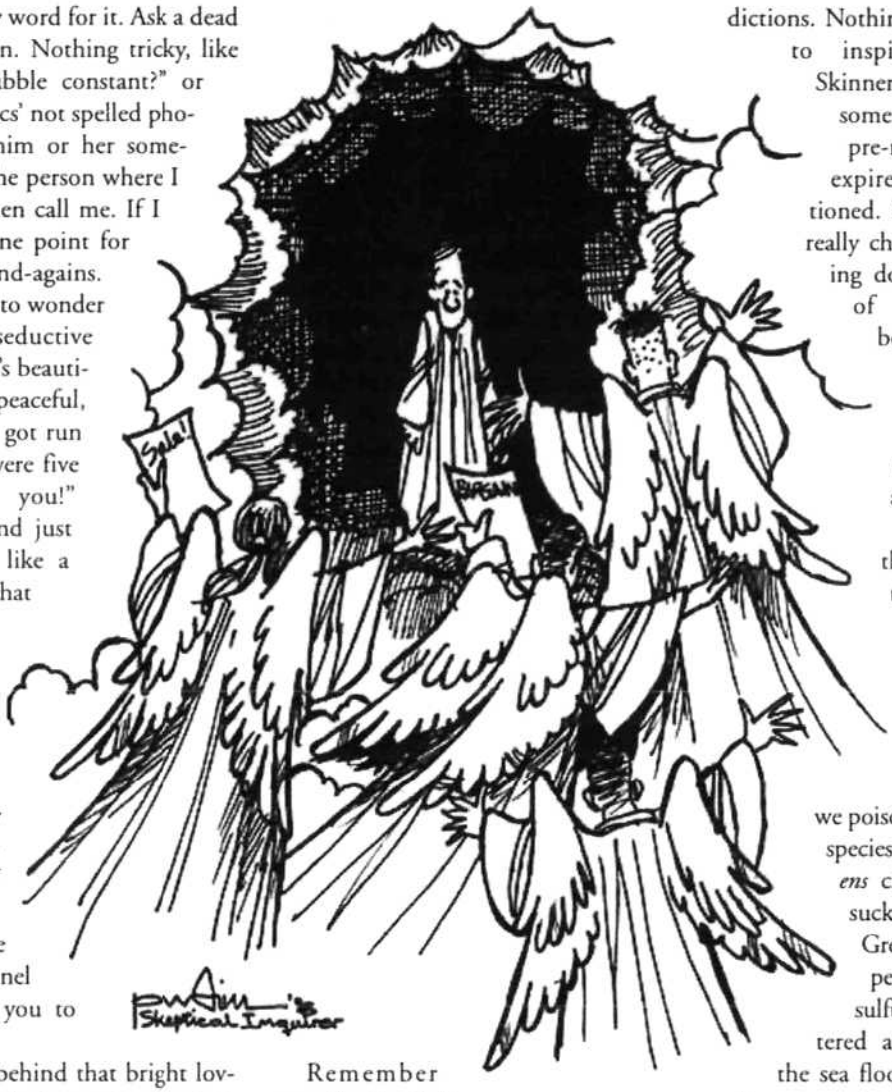
So how do we know we get do-overs? What proof do we have that the cosmos dishes out gold stars and frownie faces? The channeled statements of the dead. If this is the case, I wouldn't be in such a hurry to advertise. Death, it seems, is not very good for you.

First of all, dead people get seriously stupid. Dumber than a chunk of sidewalk. Einstein, who believed mathematics was poetry, the language of the universe, could no longer calculate a square root. I once asked a channeler to contact Murray Gell-Mann. I realize the esteemed Dr. Gell-Mann, may his big brain scintillate for decades to come, is not dead. I just wanted to see what would happen. Forgive me, I had no idea quarks were a gift from an ancient Pleidian named Izzy-Ra. Also, I don't want to alarm you, but I tried your kugel recipe. I grovel before your superior talents, sir, but I think I'll go back to boiling the noodles *before* baking.

Kat Meltzer writes from San Francisco.

Don't take my word for it. Ask a dead person a question. Nothing tricky, like "What's the Hubble constant?" or "Why is 'phonetics' not spelled phonetically?" Ask him or her something easy. Ask the person where I lost my keys. Then call me. If I find them, it's one point for the born-again-and-agains.

You also have to wonder about their seductive maunderings. "It's beautiful here, it's so peaceful, your puppy who got run over when you were five is waiting for you!" Doesn't this sound just the smallest bit like a telemarketer? What if the dead are actually working a pyramid con scheme? What if channelers and mediums are actually focus group facilitators? What if all those beckoning figures at the end of the tunnel are there to get you to sign something?



And what if, behind that bright loving light, are the dead, wearing headsets and punching autodialers? And the biggest, shiniest guy of all floats around their drab cubicles barking the steak knives speech from *Glengarry Glen Ross?*

Or maybe existence on the other side of the veil really *is* all chirpy and cheery and pink and gooshy. This is not good news for me. I would not cope well with this afterlife. I can't stand perky people on *this* side. I want to bite them but I'm afraid they'll stick to my teeth. Promise me, I beg you, if I return to spout trite insights, you will dig me up, scoop out my heart with a rusty spoon and boil it in balsamic vinegar.

Which brings up another problem. How come the dead don't whine? So what if everything's so beautiful and perfect on the other side? Everybody whines! What the hell happens to these dead people?

Remember your Auntie Crab and Uncle Burp, who found fault with everything. Eventually Auntie Crab crumps. At the funeral everyone finally exhales. Then they take turns imitating her griping about the eulogy, the turnout, little black dresses, cheap hooch, and Jell-O salad. Six months later Auntie Crab starts sending messages. Now that she's dead, she is finally truly happy. The implication here is that the best thing we can do for the chronic kvetch in our life is put her down, like an evil incontinent cat.

Speaking of which, how come we never hear from anyone in hell? For motivation to repent, it would be hard to beat a voice from the fiery pit. I can only imagine:

Me: Uncle Burp? Is that you?

Medium: AAARRRGGGHHH!

Then there are the apocalyptic predictions. Nothing like a touch of death to inspire grandiosity. The Skinner box part of life eludes some guy through his entire pre-moribund existence. He expires operantly unconditioned. Now he's back and he's really chatty about the impending doom of humanity. Lots of finger-shaking from beyond the grave. This from a man who died in a tragic anvil experiment—after all, the coyote always walked away.

Maybe, just maybe, this time the species is on the verge of extinction. Humans are special, and I'm fond of several of them. I do not want to become extinct. But suppose it happens. Suppose we poison, fry, and detonate our species to oblivion. *Homo sapiens* circles the drain and is sucked at last beyond the Great U-Bend. What happens? We come back as sulfur-loving microbes clustered at scalding breaches in the sea floor under countless tons of water, and we work our way up to being cockroaches. And we deserve it for being so careless as to lay waste to an entire planet.

If reincarnation is the way of the cosmos, then extinction should not be a problem. Time is on the side of Life with a capital L. If it doesn't include a certain bunch of great apes, the ones who shave, the ones who diet, the universe will go right on expanding. Presumably Life will find a way to carry on.

Reincarnation offers a placebo for thanatophobia, and placebos can be amazingly effective. Why get all prickly about such a cuddly, hopeful belief? Well, if you calculate the ratio of bodies to souls, you have to bring in vast numbers of souls from other planets to make the math work out. It perverts personal responsibility to a control freak's dream: You choose the circumstances of your

birth. It also replaces social responsibility with fate.

Because it replaces social responsibility with fate. You bumble through life, you die, you get your grades. (Think of it. You're going to hear "Not living up to your potential" even when you're dead.) You are assigned to your next life as a punishment or as a reward. Good news, perhaps, for babies Trump and Gates. Hurrah for the divine right of kings! But consider a starving Tutsi toddler who watched his mom get hacked to pieces by the neighbors. What do you say? "Let's get you the hell out of here and by the way, have a sandwich." Or "Firm but fair, laddie. You musta really screwed up last time. I sure hope you learned your lesson."

Because it perverts personal responsibility to a control freak's dream. In this version, you, not Mrs. Grundy or the archetypal Dad, choose the circumstances of your birth. The essentials come from Tibetan Buddhism, a wise and compassionate tradition. Remember all the stoners who read *The Tibetan Book of the Dead?* Maybe it was the dope, maybe it was television, but we now have a population with the attention span of a chihuahua. A very American chihuahua full of pioneer spirit, can-do enthusiasm, and a nasty little territorial domain habit. An American Chihuahua for the millennium who barks the Twelve-Step slogan: "Take what you like and leave the rest."

We'll take the "choice of rebirth" part. Choices put us in the driver's seat. And thirty-one flavors and 500 channels aren't enough. So why did I choose myopia, chubby knees, and a predisposition to heart disease? Never mind, I'm sure I had my reasons. We'll even take the Bardo concept—sort of a post-mortem Department of Motor Vehicles, right? Purgatory with a lot of waiting in line?

But the lifetime of meditation, service, and discipline required to calm the mind so that the soul can withstand the onslaught of forty-two peaceful deities, fifty-eight wrathful ones, flashing lights, the whirlwinds of karma, a barrage of visions—excuse me, my beeper just went off. What was I saying? Oh yeah, the vision thing. Who has the time?

Think of weary cafeteria ladies, janitors who sign their paychecks with an X, junkie babies, schizophrenics who sleep in cardboard boxes. A psychic once told me my profoundly retarded sister had chosen her brain and body so that she could help my mother grow. I asked if he could see any dental work in his future. He didn't get it.

Accepting the concept of reincarnation leads to a callousness about life and a callowness about death. Because when we invoke the power of choice where there is no power and no choice, we pass the irretrievable minutes of the one life we are sure of in illusion. And real choices, hard ones, are waiting.

Like it or not, things end. Personally I work better under a deadline. □

MAGNETIC THERAPY

from page 30

attributed to placebo effects and to other effects accompanying their use. For example, the magnetic back braces used by many senior golfers may help ease their back pains through providing mechanical support, through localized warming, and through constant reminder to the aging athletes that they are no longer young and should not overexert their muscles. All these effects are helpful with or without magnets. One British study of pulsed-field bone-growth stimulators, which were approved decades ago by the FDA, found that they were equally successful when the devices were not activated (Barker 1984), and concluded that their effectiveness resulted from the enforced inactivity associated with their use, rather than from the pulsed magnetic fields.

The more extreme claims of magnetic therapy, such as curing cancer by hanging supermagnets around your neck, are not only nonsense but also dangerous, since they may divert patients from seeking appropriate treatment from mainstream medicine. Magnetic jewelry and most other magnetic-therapy products probably are harmless beyond a waste of money. Several years ago, a double-blind study found that magnetic necklaces produced no relief of neck or shoulder pain (Hong *1982).*

The results of the Baylor study, however, raise the possibility that at least in some cases, topical application of permanent magnets may indeed be useful in pain relief, a conclusion that should be regarded as tentative until supported by further studies. Any mechanism for such an effect remains mysterious, but an effect of static magnetic fields on the complex electrochemical processes of the human body is not impossible. My own guess is that inexpensive refrigerator magnets are as likely to provide help as the more expensive magnets marketed specifically for therapy. (But since human nature leads us to expect more from more expensive items, use of refrigerator magnets will probably decrease the placebo effect!)

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Mars Effect—Dead or Alive?

Dissenting from J.W. Nienhuys' 'Retrospect'

SUITBERT ERTEL and KENNETH IRVING

Is the Mars effect dead? Dr. Nienhuys' retrospect on the Mars effect (Nienhuys 1997) might be premature. Why? He makes his case by referring to Gauquelin's athletes database, which he deems biased. Yes, Gauquelin's *published* database of N = 2,888 is biased, as was shown with Gauquelin's cooperation several years ago (Ertel 1988). Ertel visited Gauquelin in Paris and copied N = 1,496 unpublished cases that he found in Gauquelin's files, combined them with the published sample, and thus obtained N = 4,384. *This total is bias-corrected.*

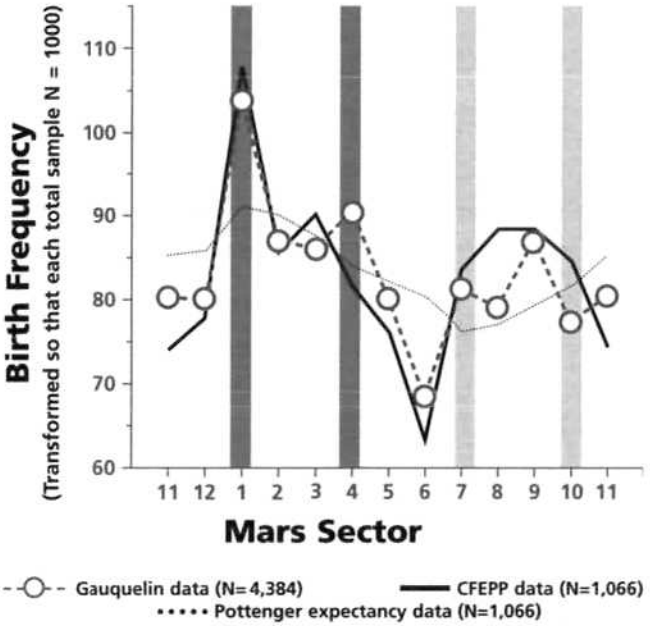

Figure 1: Comparisons of data for the Mars Effect

Ertel provided this database to the Dutch skeptics, and in his article Nienhuys makes use of it. So Nienhuys or others who have this data should be able to make the simple comparison shown in Figure 1 between the distribution of all of Gauquelin's data and that of the CFEPP. The birth distribution of Gauquelin's corrected athletes' sample across twelve Mars sectors can be seen in the dashed curve of Figure 1. Even with bias removed, a remarkable peak of births with Mars rising and a slight peak with Mars culminating is apparent (birth excess in the two *key sector zones*).

The figure also shows the distribution of the French skeptics' athletes (CFEPP) across the twelve Mars sectors. Strangely, this distribution hardly deviates from Gauquelin's, and the correlation CFEPPC-Gauquelin is $r = 0.85$ which is highly significant ($p = 0.003$) (CFEPP and Gauquelin deviations from chance expectancy must be used here as variables, not original frequencies). Nienhuys, placing full confidence in the CFEPP's data, says that the Mars effect "most likely has been an illusion after all" (p. 24). But the correlation shown in Figure 1 is difficult to class as an illusion. For both samples, the athletes' births peak considerably at the point where Mars rises. The hump in Gauquelin's data when Mars culminates is not replicated in the CFEPP's data, but this hump is small anyway. Moreover, an astounding parallel drop is apparent in the two samples down to sector number 6 and a rise is seen again up to sectors 7-10 when Mars sets and reaches its lower culmination. Nienhuys already noticed, in Gauquelin's data and in his suggestions for changes to the CFEPP sample, these *secondary* deviations from expectancy, though he felt they were due to some "secondary" selection bias on Gauquelin's part. But how can such bias on Gauquelin's side slip into the CFEPP's data as well, since these were collected independently, "from scratch," as Nienhuys says.

It is true that the CFEPP's *primary* birth deviations only (Mars percentage for rise plus culmination) do not reach the conventional significance level of $p = .05$. Very significant only is the Mars percentage in Gauquelin's bias-corrected total ($p = 0.00007$). Why is the CFEPP's

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critical percentage not significant while the correlation of its distribution with Gauquelin's distribution is? Shouldn't we try to find an answer to Nienhuys' question ". . . Where are those famous champions that the CFEPP deviously excluded to suppress the Mars rate?" (p. 29)? This is a question that we need to take seriously rather than rhetorically.[1]

Notes

1. We make no comment on the CFEPP's intentions, but the answer to Nienhuys's question can be found in sample adjustments suggested or endorsed, but not followed, by the CFEPP in their own report, and also in one important omission from that report. Readers will find details of these and other points in our full article, "The Mars Effect in Prospect. Dissenting from J.W. Niehuys' 'Retrospect'" at Ken Irving's 'Planetos' web site http://members.aol.com/kirving.

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Responding to Ertel: Mars Flukes

JAN WILLEM NIENHUYS

When Gauquelin published his first results in 1955 he displayed data for ten professions (such as physician or criminal), each matched with sun, moon, and eight planets, both for a 12-sector and an 18-sector system. Out of 200 possibilities, the combination of Mars with sports in the 12-sector system yielded the strongest results for rise and culmination. That's why this link was investigated further. This answers J. Azad (*SI*, Letters, March/April 1998).

Jan Willem Nienhuys is a mathematician at Eindhoven University of Technology, 5600 MB Eindhoven, Netherlands.

When one checks an hypothesis, one should not include the data that gave rise to it. That's one bias Ertel didn't correct. Moreover, Ertel and Irving have missed the main point of my article, namely that Gauquelin might have biasedly thrown out "unreliable" data. Ertel didn't correct for that either.

The test of the CFEPP compared a null hypothesis (no Mars Effect) with one of Gauquelin (22% of champions are born in Mars sectors 1 or 4 of the 12-sector system). The null hypothesis was not rejected ($p = 0.42$). So in 1955 it was a selected fluke after all. Since 1988 Ertel has been trying to show that there still is a Mars Effect, often by cleverly emphasizing the importance of hypothesis-forming data. Now he does it again.

Ertel and Irving plot a couple of graphs and ask why they are so alike, even though the CFEPP didn't "reach significance?" The answer is easy to understand. Both data sets include many of the original 1955 data with their "fluke" Mars Effect. Even without these 1955 data the CFEPP data consist about five sixths of Gauquelin data. Data that share so much are necessarily correlated. That's a predictable artifact of this type of analysis and it has nothing to with a possible reproduction of the Mars Effect. What an "astounding drop" at sector 6 has to do with Gauquelin's love for sectors 7 and 10 escapes me completely.

Meanwhile Ertel and Irving insinuate some kind of sinister skeptic plot to account for the absence of CFEPP significance. It's just another of Ertel's attacks in which a poor grasp of statistics is used to launch another innuendo about skeptic bad faith.

Recently Ertel has attacked the German magazine *Skeptiker* and its editor with at least N = 3 lawsuits (Ertel lost). *Skeptiker* had printed things about the Mars Effect Ertel didn't like, even after he had got N = 3 closely printed pages to have his say. In my eyes Ertel has thereby forfeited the right to be taken seriously at all in a scientific discussion. □

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Dawkins's 'Science, Delusion, and the Appetite for Wonder'

Richard Dawkins's "Science, Delusion, and the Appetite for Wonder" (March/April 1998) is a brilliant defense of the notion that science can offer wonders far beyond anything conjured up by religion, pseudoscience, New Age imagination, postmodern philosophy, or media hype. Dawkins demonstrates that the vast accumulation of knowledge provided by science represents the best that humans can achieve in the attempt to make rational sense of the physical universe.

I stand four-square behind such efforts. But I have one slight quibble. By way of illustrating how much knowledge science has provided us in the past 2,500 years, Dawkins uses Aristotle as an example of one who knew far less than we do. No argument there. And, as he goes on to point out, our grandchildren will know far more than we do. This is all thanks to the accumulation of scientific knowledge. My complaint is that Dawkins has missed a fine opportunity to at least note that, while Aristotle had access to far less information than those who followed, he made a contribution to science that in many ways rivals that of any scientist from his time to ours. Let me explain why I think Aristotle still matters so much to science. . .

Aristotle made a lasting contribution to science. But to appreciate this, one must first consider the view of the natural world held by his famous teacher Plato. Plato was convinced that no object that can be perceived is either real or knowable. This was one consequence of his conviction that whatever is real and knowable must be eternal, unchanging, and directly accessible to the mind. Objects of perception, things in the natural, material world, must be mere illusions. The material universe, for Plato, was not anything about which we could have knowledge. Mathematics, in contrast, was safe as a source of genuine knowledge since its objects were eternal, unchanging, imperceptible. But the rest of what we would call science was preempted by Plato's metaphysical and epistemological vision.

Unlike Plato, Aristotle, the son and grandson of physicians, was convinced that material objects could be known. He held that whatever was real and knowable must be found in objects of perception, things in the natural material world. Such things are always, in principle, knowable-science, the systematic accumulation of such knowledge, was possible. Moreover, he believed that the search for such knowledge was natural to humans, for, as he wrote, "All men by nature desire to know." Parenthetically, Aristotle included mathematics in science by contending that its objects were to be found in material objects, differing from the latter only in being changeless.

Again, unlike Plato, Aristotle was himself a working scientist, making significant contributions to marine biology in particular. But the important, lasting contribution of his life's work was his insistence that the material universe could be known. His view, not Plato's, prevailed for the next several centuries. And once the church yielded its place in scholarship to the new scientists of the Renaissance, Aristotle's legacy flourished, even though he himself was ignored or rejected by these heirs.

The history of science over the last six centuries has frequently been punctuated by vigorous challenges to science from the friends of superstition, intolerance, and unreason. At the dawn of a new millennium, at a time when science has repeatedly shown itself in all of its branches to be a boon to the health and happiness of mankind, it once again faces such a challenge. Political and religious forces have joined the enemies of reason in a sustained, broad attack on science. Once again we live in what Sagan called a "demon-haunted world." Friends of science cannot afford to reject anyone who would help in the defense against this attack. In particular, they cannot forget Aristotle. He was the one who first taught that science is possible, even natural. He still matters.

George Englebretsen
Department of Philosophy
Bishop's University
Lennoxville, Quebec

I fully agree with Professor Dawkins's suggestion that courses on the philosophy, history and achievements of science may be more effective than laboratory-based science classes in spreading scientific literacy among those who choose nonscientific occupations.

Two distinct needs should be addressed: the need for everyone to possess enough basic scientific information to make sense of the world (How does the blood flow? What is "probability"?) and the need for critical thinking skills. Both can be fulfilled by non-laboratory-based classes that emphasize the conceptual rather than the technical aspects of science. The scientific method is primarily a way of thinking, which generates technology but does not identify with it.

What's often lost in the general public's misconception of the scientific process is how similar science and art really are. Contrary to myth, new scientific theories do not automatically result from tedious data collection. To conceive a hypothesis that convincingly explains the answers nature provided is as creative an act as writing a poem which compellingly expresses a profound emotion. And to see that hypothesis elegantly explain an aspect of reality more clearly than ever before is cause for great wonder and aesthetic pleasure.

It's time we rediscovered the well-rounded person who can enjoy a poem *and* appreciate the knowledge, clarity, and beauty science has brought to our view of the world: a new Renaissance human.

Lucio Miele, M.D., Ph.D.
Marriottsville, Md.

Richard Dawkins's elegant and eloquent lecture on "Science, Delusion, and the Appetite for Wonder" inadvertently highlights the core of the problem with astrology. "Who'd go back to astrology when they've sampled the real thing—astronomy?"

While I'm totally in agreement about the awe factor involved in a genuine perception of the vastness and complexity of the universe, that is not why folks turn to astrology. People, in fact, are not turning to "astrology," they are turning to an "astrologer." The average "believer" is looking for three major things: emotional solace, answers to practical everyday questions, and someone to listen to them.

One might argue persuasively that the true wonders of the universe are sufficient for emotional solace, but it is not the province of astronomy (or astronomers) to advise the lovelorn on which of their current boyfriends to marry. Until we under-

stand the true "issue" and are able to find a substitute method to answer those troubling and nagging everyday problems that the mass of human beings (me, too) are often overwhelmed with, it is unlikely that the working poor will stop throwing their money at astrologers instead of at groceries.

As a simple-minded, accessible "advice system" astrology is almost unsurpassed—regardless of its accuracy (which has been demonstrated to be either nil or only as good as the recommendations flowing from the "wisdom" of the astrologer). Unfortunately, the offer of the aesthetic beauty of pure science will not (from the point of view of a divorced woman out of work with three children to feed) put dinner on the table.

That is the question that astrology pretends to answer and the problem for which it offers comfort. It would behoove us all—scientist and lay person alike—to find a problem-solving substitute for astrology which has, at its core, real human knowledge and wisdom, rather than empty (though sometimes well-phrased) platitudes and (to give them the benefit of the doubt) well-intentioned frauds

Edward Summer
New York, N.Y.

Richard Dawkins's lecture/article was a most excellent and fascinating discussion of the meaning of science. It was something special even among the other most outstanding articles in this great edition of *SI*—Martin Gardner's interview, Houdini, Havels, SHC, Bible Code, etc.

I do want to point out an interesting item in Dawkins' article in the section where he mentions "incompetence in mathematics," In the preceding paragraph he discusses eating quarks, and quotes Sir Allen Cottrell is saying that one "eats 500,000,000,000,000,000,000 quarks a day," (5×10^{20}).

Unfortunately that's not much of a meal. It appears that about seven zeros are missing. I'm sure that other readers have noticed this underestimation. Perhaps Dawkins didn't mention it just to check on our "mathematical incompetence."

George Shenkas
Detroit, Mich.

Prof. Richard Dawkins's "Science, Delusion, and the Appetite for Wonder" was excellent and thoroughly enjoyable. It's a must for ladies and gentlemen who feel no need for scientific knowledge and literacy. There is one thing I want to comment on. Prof. Dawkins writes ". . . but it is socially acceptable to boast ignorance of science and proudly claim incompetence in mathematics—in Britain, that is. I believe the same is not true of . . . , and Japan." Actually, the same is true of Japan. And the problem is that although there are many explanatory books of science, thought-provoking books and articles such as Prof. Dawkins's are very few.

Motofumi Kuze
Science Educator
Utsunomiya, Japan

Nonrational Processes in Science

Your March-April issue was very stimulating reading. The articles by Richard Dawkins and Will Cooper are well composed. But it's really disheartening to read such eloquent arguments for emphasizing rationality in both science and in science education. The fact is that every productive research scientist cultivates and relies upon nonrational processes to direct his or her own creative thinking.

For example, Watson and Crick used visualization to conceive of possible configurations of the DNA molecule. Einstein used visualization to imagine riding on a light beam. And Einstein also used a haptic muscle sense which told him when he was on a good track. Srinivasa Ramanujan usually saw a vision of his family Goddess Narnagiri whenever he conceived of a new mathematical formula. August Kekule visualized atoms he couldn't actually see. The list goes on and on, and is presented more thoroughly in many modern books on creativity.

The heart of good science, it seems to me, is the harmonious integration of good luck in making certain uncommonly made observations, nonrational processes that are only poorly suggested by the vague words "creativity" and "intuition," critical thinking, rationality, and the willingness to carefully test ideas, yes even the most sacred ideas. If rationality were actually the heart of science, then Euclid would be studied as a scientist, rather than as a mathematician, and Spinoza would be studied as a scientist rather than as a philosopher. . . .

I personally believe that one reason why so many people today don't understand or care a lot about science because as developing children, their sense of wonder and curiosity wasn't nurtured in school by teachers who really know a lot of facts, but lack the great spirit of science. The earnestly seeking mind of a young child isn't all rational, and the reasons adults give to explain an observed phenomenon and the reasons adults give to explain why a certain thing isn't possible are often incorrect. Science can't ever advance until some super-intuitive person finds a flaw in some old way of thinking. And schools themselves actually punish the earnest child who corrects his teacher, or who asks "too many questions." . . .

John L. Waters
Trinidad, Calif.

Houdini, Conan Doyle, and Holmes

No, no, it's just impossible "Houdini and Conan Doyle: The Story of a Strange Friendship" (*SI* March/April 1998). Consider, please, the absolute delight in observation and reason evinced in Sherlock Holmes. Remember the occasions when a few words of explanation transformed bourgeois amazement into pompous dismissiveness, much to the sly amusement of the master. Can a naturalistic universe contain so much irony as would be required for Doyle to unconsciously ape the hapless victims of his own creation's wit?

Thusly eliminating the "impossible" leaves the charming hypothesis that Doyle's credulity was in fact a quirky bit of magic which mystified the greatest magician in history. Under this interpretation (which, by the way, I have decided to adopt fideistically, I find it so enchanting) Doyle's protestation that his friend actually had the powers the two were arguing about is the master's touch.

Danny Purvis
Columbia, S.C.

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Martin Gardner and 'Mysterians'

Martin Gardner may not have to turn in his skeptic's license, but perhaps a corner should be torn off for his comment, "I belong to a group of thinkers known as the 'mysterians.' It includes Roger Penrose, . . . and many others who believe that no computer, of the kind we know how to build, will ever become self-aware and acquire the creative powers of the human mind," ("A Mind at Play," Interview, March/April 1998).

I call this attitude the "new vitalism" for its parallels with the old vitalism—the long-abandoned belief that there was a fundamental and spiritual difference between unliving and living matter. Now the mysterians would revitalize the concept, applying it to unanswered questions about consciousness. They claim, without demonstration, that computers cannot possibly become self-aware. Penrose, in his book *The Emperor's New Mind,* appeals to the incompleteness of mathematics to support this idea, but those arguments do not apply to computers that include true random-number generating hardware and external sensors. Gardner may be correct about the impossibility of mechanical consciousness, and he may be wrong, but I hew to the skeptical position: for now, we simply don't know.

As to whether computers are capable of acquiring the "creative powers of the human mind," we need pre-agreed-upon tests and protocols to determine what constitutes acceptable performance to be considered as having achieved human-level creative powers. It was not to too long ago that playing world-championship level chess might have been considered a task that requires strategic creativity beyond the scope of computer algorithms.

Jef Raslom
Pacifica, Calif.

A Speck of Wonder

Martin Gardner's column, "Did Adam and Eve Have Navels?" (March/April), revived the sense of wonder I had during childhood.

I often wondered if the entire universe is a speck underneath someone's fingernail.

John A. Mozzer
North Hollywood, Calif.

Firing Line Creation/ Evolution Debate

Christopher K. Frazier's report (Media Watch column March/April 1998) about a televised debate between creationists and evolutionists was an interesting read. But Mr. Frazier throws into his article a few observations and antimaterialist remarks that reveal much about the contradictions inherent in his own position and that of some of the debaters on the pro-evolution side. For example:

> Lynn, the team leader [of the evolutionists], outrightly disavowed materialism as the exclusive form of truth and argued convincingly that the ideas and intent of religion and evolutionary theory are different but compatible.
>
> It was refreshing that two of the evolutionists acknowledged their own religious beliefs and thus helped disarm any strong religion-versus-science polarity common in such debates. As an evolutionist, I find it onerous to be equated with an atheist or to be held to the notion that teaching evolution is equivalent to teaching that life has no meaning and that morality is some sort of sham.

We can easily agree that the intellectual position of the creationists is extremely dubious, but we should at least give them credit for one thing: they recognize the *real* issue. The debate is between religion and science. Religion is the original pseudoscience. (I challenge anyone to explain the distinction between the concepts "nonmaterialist" and "paranormal.") I personally find it onerous that many of those who defend the scientific point of view so frequently find it necessary to bend over backwards and perform other contortions in order to avoid criticizing religion in a direct and frank manner. And I find it odious that atheism should be equated with amoralism, as if belief in some nonmaterial spirit were required to keep us all from killing each other. Morality may not be a sham, but the idea that it could be divinely inspired and/or enforced is certainly an enormous hoax. In fact, morality is merely a compromise among human beings attempting to live together in this very material world.

David Rand
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I did not share Christopher Frazier's enthusiasm for the *Firing Line* Creation/ Evolution Debate. I agree with him that Kenneth Miller was definitely the anchor of the evolution side. I think additional biologists would have strengthened the debate much more so than the "diversity of backgrounds" of the other participants. I found it very interesting that Barry Lynn, a Christian minister, was included on the pro-evolution side. Since he is not a professional scientist, what was he doing there? The answer seems to be that the pro-evolution side was as much concerned with not offending religious sensibilities as it was with presenting the case for evolution. This played right into the hands of the creation side. By trying so desperately to avoid the label of materialists the evolution side made it look as if the creation side was making a substantive point.

The evolution side should have *embraced* a "naturalistic" viewpoint. *Of course* scientists assume that there is a natural, material explanation for the origin and evolution of life. This doesn't prove that there is no supernatural involvement, but the evolution side should have pounded home the point that invoking "intelligent designers" (whether it's God, gods, or space aliens) doesn't explain anything at all. It only makes the problem worse (who made God or the aliens?). Furthermore, creationism is absolutely sterile in terms of generating research (the answer to all questions becomes "because the intelligent designer made it that way"). The creation side should have been pressed to give even one example where science had progressed by invoking supernatural causation (vitalism, etc.).

Another point that could have been emphasized by the evolution side is that debates don't determine scientific truth. Evidence is what matters. Creationists love the debate format. The audience is usually

ignorant of the evidence. Creationists can attack evolution without having to support their own case. To their credit, the evolution side in this debate tried to get the creationists to present their alternative to evolution. Of course, they had nothing to offer. But audience members who were unfamiliar with the massive, publicly available evidence for evolution and natural selection could very easily have come away from the debate with the idea that there is no objective "truth" in the creation/evolution debate—that it is just a matter of opinion or philosophy. The audience could have been encouraged to go out and *look* at the evidence themselves.

Phil Frymire
Tulsa, Okla.

I am extremely disappointed to see an evolutionary biologist and *SI* columnist arguing that, while empirical evidence may point to man being an evolutionary relative of apes, he can nevertheless find himself in agreement with William F. Buckley that "other forms of inquiry, such as faith," may lead to the conclusion that man is in some sense related to "angels."

I fail to see any sense in which "faith" can be called a "form of inquiry." And to Christopher Frazier's rhetorical question, "Isn't there some equal measure of truth in the feelings and reflections brought about by poetry, music, and painting?"—The answer must be a ringing, "No!"

Feelings and emotions do not operate on a scale of "true and false," but on an unrelated scale involving empathy and antipathy, desire and disdain, comfort and unease. When someone close to us dies, we miss them, and we have an emotional response to our loss. We also have emotional responses to the poetry of the Bible, the music of the church, and paintings of heavenly hosts. Those feelings are quite real, but their translation into a conviction that our loved one has "returned home to live among the angels" has no truth value whatsoever.

Frazier finds it onerous to be thought of as an atheist, just because he is an evolutionist; I find it equally onerous to hear him equate atheism with the "teaching that life has no meaning or that morality is some sort of sham." Frazier is not only wrong, but doubly wrong when he says that emotions (and implies that morality) are "quite outside the realm of scientific scrutiny." First, science never gets done at all without an emotional commitment to rational inquiry, as well as a moral commitment to speaking the truth. Second, as part of the evolved suite of physiological responses to environmental stimulation that we have inherited from our ape-like ancestors, emotions (including religious convictions) are becoming ever more a subject of scientific investigation.

Norman F. Hall
San Diego, Calif.
http:www.godless.org

Christopher Frazier responds:

Within the scientific community there is no debate concerning the veracity of the theory of evolution. The greater issue, for which evolution becomes only a marker for science in general, is whether we should teach science in the classroom unadulterated by belief-based "theories" and whether teaching science constitutes an attempt to teach godlessness to our students. I believe that the pro-evolution side in the Firing Line *debate did well to include a philosopher and a Christian minister [executive director of Americans United for Separation of Church and State], so as to address these less scientific aspects of the creation/evolution debate.*

Frymire makes the point that debates do not determine scientific truth, a point I agree with. But loading the pro-evolution side with scientists, I believe, would have given more credence to the impression that debate has a place in determining "scientific truth" while diminishing the quality of discussion concerning the wider issues involved in teaching evolution. As to Hall's point that even emotions are within the purview of science, I am reminded of a statement by one of the leading researchers in the science of beauty and body symmetry, Dr. Randy Thornhill. When speaking about his work he is careful to state that science has a lot to say about "what is," but absolutely nothing to say concerning "what ought to be."

Science is not a tool for moral or ethical guidance and I believe that the science classroom is no place to pit science against religion; it is enough to teach good science well. Two of the authors seem to feel that in my review that I equated atheism with amorality. This was not my intention, nor, I believe, what I wrote.

The Power of Placebos

Two views of the validity of acupuncture were reported in the News and Comment section of the March/April 1998 issue. The report from *Scientific Review of Alternative Medicine* appears to have been guided by some very subtle fuzzy thinking. They said that the best studies of acupuncture show the therapy is no better than placebos. The premise of this statement is correct. We can say that something is effective in therapy only if it is better than the placebo in a double-blind controlled study.

However, I see no way to perform a placebo control with acupuncture (the fuzzy thinking I mentioned above). Anything less than placing needles is not an adequate control. So, should we have a non-practitioner place needles randomly? Or, should we have an experienced practitioner place the needles in the wrong places? These controls are only single-blind at best.

I do not imply that acupuncture works better than the placebo, or vice versa. What I do mean is that by using the most accepted techniques, we cannot answer the question about its efficacy. What we believe, therefore, becomes a faith statement, rather than science. On the other hand, perhaps we could find a group of blind subjects that cannot feel anything. . . .

Alan B. Combs
College of Pharmacy
University of Texas at Austin
Austin, TX

I am stimulated to write by the statement in News and Comment calling placebos *inactive treatments.* I would like to come on strong as having done placebo controls for many years. They are far from inactive! They "work" dismayingly well! That is why it is very difficult to acquire a statistically significant difference between a double-blind placebo control group and the active ingredient treatment group. In double-blind experiments neither doctor nor patient knows what he is using.

An even worse effect can be had. Fifty

years ago, the inimitable Dr. Al Kligman, *at the University of Pennsylvania, where* the double-blind placebo control was just coming in, invented his own modification—*the double blind, double cross!* The University of Pennsylvania had several skin hospitals under its aegis. In Hospital A, Dr. Kligman told the residents that ointment X was the control, and ointment Y was the real McCoy, but, of course, the patients must not know this. In Hospital B, Dr. Kligman told the residents that ointment X was the active ingredient, and ointment Y, the placebo control. Again, the patients must not know this.

As a matter of fact, all the ointments were exactly the same. The residents were double-crossed. The only difference in ointment effects was the degree of enthusiasm with which the residents gave them to the patients. Actual recording of the residents talking to the patients, exaggerating a bit, they would say for what they thought was the placebo, something cursory like, "We want you to try this; it probably isn't much good." Whereas with what they thought was the real McCoy, they would come on with much more enthusiasm. A statistically valid response was found on this with a small number of patients, but Dr. Kligman made enemies, some of whom even now have probably not forgiven him. He glories in the fact, and calls himself a cantankerous old curmudgeon now in his 80s, but fifty years ago, was certainly an iconoclastic young curmudgeon!

Herpes simplex (cold sores, fever blisters) infections respond 50 percent to placebo medication. When I was one of the investigators with 5-iodo 2 prime desoxyuridine, with my patients—I couldn't pick up a difference from the placebo. Going to something as clear cut as whether Rogaine applied does or does not stop or reverse hair fall, the fact that it improves hair growth in 67 percent (and the FDA agrees that it does) is not so remarkable as the fact that the placebo control improves it in 50 percent.

Wart therapy—painting the warts with colored distilled water and a Woods light shone on it so that the children could see the fluorescent color—goes back to long before my birth 78 years ago. Hypnosis has cured warts so routinely that in England they tried hypnotizing patients and telling them that only the warts on the left side would go away, whereas the ones on the right side would remain intact. *After the hypnosis, this frequently happened!* Since wart virus is extremely easy to see, and extremely easy to transmit from person to person, it sort of lets the camel's nose in the tent to admit that faith healing will cure this obvious virus infection. In that case, why can't it cure cancer as well, another putative virus infection?

Placebo reactions are not always beneficial or pleasant. Many years ago, I was doing a clinical evaluation on a new appetite-suppressant drug. Since it is still on the market, I won't mention it. Getting a statistically significant amount of weight loss with a placebo control in any weight-reducing program is extraordinarily difficult, because any patient who gets into a weight-reducing program has made up his mind that he or she is going to lose weight! You can give them a sugar pill, or nothing at all, and they will proceed to lose weight for a while. This blurs the response to the "real" drug. . . .

Murray C. Zimmerman, M.D.
Clinical Professor of Medicine, Emeritus
USC School of Medicine

Corso's Anachronisms

I refer to the review article "Philip Corso's Roswellmania" by Brad Sparks, March/April *SI*, about Corso's claim that (among other technologies) microwave ovens were developed from alien technologies found in the wreckage of the famous Roswell, New Mexico, UFO event.

Wrong, Mr. Corso! Sometime in the middle 1930s I happened to visit a traveling science exhibit in Houston, Texas, provided by the General Electric Company. In one demonstration an iron nail was slipped into a wooden sleeve and placed in a prototype microwave oven. The power was "turned on" and about three minutes later the wooden sleeve and nail were removed from the oven. I was amazed! The iron nail was glowing white hot but the attendant handled the wooden sleeve with impunity. Mr. Corso's timing was off by about fifteen years.

Travis Middleton
Houston, Texas

Pseudostatistics?

How ironic that your report entitled "Survey Finds 70% of Women, 48% of Men Believe in Paranormal" (News and Comment, March/April) exhibited "Pseudostatistics." According to the article, these results are from voluntary responses to a questionnaire published in the *Daily Telegraph.*

No results based on voluntary response surveys are worth much because the responding group is usually biased. These results are even more biased because they are based on readership of the *Telegraph* rather than on a representative group. Reporting such trash as straight news is fully as bad as the credulous reporting of *pseudoscience by the mainstream press.*

The disclaimer at the end of the article that "the results cannot be generalized to the whole population" is hardly sufficient. In fact, the results speak only of the population of readers of the *Telegraph* who chose to respond to the study. But the headline would lead one to think that, for example, there is a real difference by gender in belief at large. That may be so, but the data from this survey provide no reliable evidence for such a conclusion.

The suggestion that the size of the study mitigates its troubled design ("While the sample was not random, it was the largest of its kind taken to date") is another widespread myth of survey sampling. No amount of additional biased data can repair the bias in a badly designed survey.

Paul F. Velleman
Department of Statistical Sciences
Cornell University
Ithaca, NY

Susan Blackmore replies:

Professor Velleman is quite right that the sample in my Telegraph *survey was not representative. However, the purpose of this survey was not to assess levels of belief. It was originally conceived for "Megalab," part of the annual British Science Week in which researchers propose studies that can be carried out using large sections of the population (i.e. BBC viewers and listeners, and* Telegraph *readers). My proposal was chosen*

and its aim was to compare believers with non-believers on their estimates of coincidences. For this purpose the self-selected sample would be adequate (unless you suppose complex interactions between belief, tendency to take part in the survey, and the variables measured).

In the end, the predicted differences were not found. However, there were some interesting findings. For example almost 30 percent claimed that their back is giving them trouble, that they are one of three children, that they own a tape of CD of Handel's Water Music, or that they have a cat. These figures (though not representative of course) give some idea of how easy it is for a pseudo-psychic to get correct information about a client. Some 34 percent said they had a scar on the left knee, which makes the claims of mysterious scars in abductees appear less unusual. Oddly enough, believers more often claimed that each of the ten statements was true for them—a surprise finding that suggests further research to find out why.

Not surprisingly the media picked up the high belief figures, publicized them with "X-Files" headlines, and in the week following publications I gave over twenty radio interviews, plus print and television interviews. I tried to explain what the study was about and why the percentages of believers may be biased. I am just glad that the media are interested in research, even it they sometimes give a false impression of what went on.

Copernicus and Circles

"Disturbing Circles" by Ralph Estling and the letter by Dick Eney in your November/December 1997 issue deserve a healthy dose of skepticism. While Estling wisely states that without preconceptions we have no science, the tone of his essay is that Copernicus stumbled because of his preconception that orbits should be circular.

Copernicus said that he would be satisfied if his theory could predict planetary positions to 10' (1/3 of the diameter of the moon). His results did not match his ambitions, but this was not a consequence of his sticking with circles. The difference between an elliptical and a circular orbit is only a few minutes of arc in the most conspicuous case (selected positions of Mars), and observational data of this accuracy were simply unavailable to Copernicus or his predecessors. Within two decades of the time when Tycho Brahe made such observations (in the 1580s), Kepler had forged a theory using elliptical orbits.

Even Kepler was alarmed when his correspondent, David Fabricius, showed how to obtain comparable accuracy with combinations of circles. "Your theory is a whore that will seduce many professors of astronomy," Kepler wrote, "but it is not physics."

Eney's letter rings the same changes as Estling, but adds the myth of "ever increasing epicycles." For a thorough debunking of that time-worn mythology, see the relevant articles in my anthology, *The Eye of Heaven: Ptolemy, Copernicus, Kepler* (The American Institute of Physics, 1993).

Owen Gingerich
Harvard-Smithsonian Center
for Astrophysics
Cambridge, Massachusetts

Alternative Medicine in a Scientific World

Charles Bagley (Letters, January/February 1998) claims that with the treatment of individual patients practitioners of alternative and conventional medicine are on equal scientific grounds. In my oncology practice, I help patients to distinguish between evidence-based and belief-based treatment regardless of whether the nominal therapeutic domain is "conventional" or "alternative." For patients and often their advisors, belief is curiously more influential than evidence (see "The Belief Engine" by James Alcock, SKEPTICAL INQUIRER May/June 1995).

There are at least two fundamental differences between belief-based and evidence-based medical practice. The first concerns the definition of "evidence." In evidence-based practice, the evidence in patient groups is controlled for other variables, preferably by randomized trial design. For uncommon conditions and historically developed conventional treatment, less rigorous evidence must be critically evaluated. Randomized controlled trials with alternative therapies have been infrequent and generally negative. Evidence of benefit in individual patients must be obtained systematically and objectively, and the possibility of coincidence always kept in mind.

The second fundamental difference relates to the individualization of therapy in a context of benefit proven in controlled trial in at least some patients versus no such proof. The art of extrapolation of the applicability of controlled data to the individual patient in evidence-based medicine is completely different from treatments based solely on a combination of anecdote and other factors, including Dr. Bagley's "imagination, intuition, etc."

Our job is to clarify these differences to patients so they may truly make informed choices.

Chris Coppin, BM, Dphil
Vancouver, B.C.

Contact's Space-Time Trip

Two readers (Letters to the Editor, March/April) are puzzled about how Ellie Arroway, the space-traveling heroine in the movie *Contact*, can be gone for 18 hours by her own reckoning and for only 40 seconds as observed here on Earth. They note that, according to relativity theory, a near-light-speed traveler returning home should have experienced less elapsed time than those who had remained behind.

The explanation is that Arroway did not necessarily travel at high speed but traveled through a *wormhole*, a short connecting tube between distant parts of space that has been conjectured as being possible on the basis of the general theory of relativity. By taking one wormhole outbound and another coming back, she could even have returned before she left! In the novel by Carl Sagan on which the movie is based the aliens who establish the wormholes state that they are careful not to violate causality in this way, because to do so is "almost always worse."

John G. Fletcher
Livingston, Calif.

A letter by Einar Young on the review of the movie *Contact* caught my attention. He points out that the review's author put it backwards when he says "because of

general relativity, the eighteen-hour trip appears to have taken only forty-odd seconds on Earth." Relativity explains that time dilates (runs slower) for the traveling person, which seems to be the inverse of what the movie's plot describes. Young suggests that the late Carl Sagan intended to describe something else.

He is right. In fact the theory that predicts (successfully, by the way) these time-dilation effects is the restricted relativity, *not the general. But my point is some*thing else. The movie's plot (and I believe this was the intention of Carl Sagan when he wrote the book) does not deal with restricted relativity effects whatsoever, but with space-time travel instead. The character Ellie says several times that she is traveling into a "wormhole," that is, a space-time topological feature that acts as a shortcut between two distant points in the space-time continuum (if such wormholes exist in the first place).

It means that if travel throughout a wormhole were possible, a person could travel between distant points in space-time feeling only a little time displacement in their reference frame. . . .

Ivo Busko
Science Software Group
Space Telescope Science Institute
Baltimore, Md.

Some respondents to Edward Summer's article "*Men in Black* and *Contact*: Night and Day," challenged the notion that Ellie Arroway had experienced eighteen hours of time during her journey while only a few seconds had elapsed on Earth. According to Adrian Berry in his book *The Iron Sun* (Warner Books, 1977), Einstein's Special Theory of Relativity allows for a person to go back in time if he/she travels faster than light. Thus Ellie's situation could possibly be explained if she traveled faster than light, and she was probably doing so, since she was visiting foreign star systems light years away from Earth within forty hours of real time. Berry quotes a limerick by E. Reginald Buller of the University of Manitoba (60):

There was a young lady named Bright,
Who travelled much faster than light,
She started one day
In the relative way
And returned on the previous night.

For those interested in reading more about science and Hollywood, check out the April 1998 *Astronomy*.

Jodin Dunbar
Alma, Ark.
Skywise7@aol.com

I Could Have Had a Pi

All this talk of the Bible Code puts me in mind of that dramatic scene near the end of the novel *Contact* [not included in the movie version] by the late Carl Sagan, where the aliens reveal to us that the digits of pi, when computed out past the 10^{20}th decimal, contain a fantastic encoded message: an image in 11 dimensions inscribed there by beings powerful enough to adjust the value of pi in order to communicate with us! If God had really wanted to leave a message, that would have been a more reliable medium than the Torah, don't you think? I can just see Him now, reading Sagan's book, clapping His forehead and exclaiming "D'oh!" (a lá Homer Simpson).

Kenneth E. Nahiginn
Sacramento, Calif.

Magnetic Treatment of Liquids

The magnetic treatment of water and fuel (January/February 1998) was very fashionable two decades ago and there are indications of a renaissance of this pseudoscience.

It was a shocking experience that in *Chemtech*, a journal of the American Chemical Society, a paper was published on the theory of the magnetic treatment of water (April 1997). I sent a letter to the journal which was published in the September issue. It appears from this letter that based on our findings Hungarian Patent 168 706, which is a version of the patent cited in the mentioned paper, was nullified on 1 April 1980. Unfortunately, the last sentence of my letter was omitted. This sentence is as follows: "I do believe, however, that all the results mentioned in the paper are due to sloppy experimentation an self-deception." This letter remained without reply from the authors of the original paper, although another letter that expressed doubt on the theory got an immediate answer from them.

The claim that the magnetic treatment of fuel can decrease the consumption by as much as 10 to 15 percent is not without some factual basis. Although no difference is found when the consumption was measured in laboratory, a good number of drivers testify the effectiveness of the treatment. The explanation is simple: When the driver begins to apply this gadget, he *or she will drive much more cautiously* and this difference may result in a considerable decrease in fuel consumption.

Mihaly T. Beck
Institute of Physical Chemistry
Kossmth Lajas University
Debrecen, Hungary

Negative Results Not a Failure

In the "News and Comment" column of the March/April 1998, *SI*, Ken Feder refers to the famous experiment conducted by Harry Houdini's widow, in which she waited for a posthumous message from the great magician. Mr. Feder states that she ". . . declared before her death in 1943 that the experiment had been a failure."

This statement blurs the important distinction between a failed experiment and an experiment whose results are negative. From the sounds of it, the Houdini experiment was fairly well controlled, and it deserves to be recognized as such.

Richard W. Sheppe
Post Mills, Vt.

Intelligent Design?

I have seen the light and I now understand what the "intelligent design" advocates are talking about. It is obvious that last year's Red River flood in Fargo/Moorhead, the recent downpours in California with ruined crops in the Salinas valley, the people killed in the tornadoes in Florida and Texas, the starving sea lion pups who have been orphaned by wild storms at sea and all the other recent weather phenomena are the consequences of the Intelligent

Designer's intelligent design.

How could I have been so blind?

David J. Simmons
Ridgecrest, Calif.

Saucer Mirages

In December 1997 my wife and I were traveling by bus from Rio Gallegos to Trelew, Patagonia, Argentina. As we were riding for a several hundred miles through "Texas" we saw hovering objects to the east. They were flat-topped, perhaps a half kilometer in length and floating a short distance above the ground.

If you haven't traveled through our desert West you haven't seen hills with their tips in the air. This is a common summer phenomenon. These are mirages, yes, sometimes there are also bodies of water, but so far never a beach loaded with naked lovelies!?

So, here in Patagonia were things that the unenlightened could well believe to be UFO's!

J. R. Macdonald
Rapid City, S.D.

Editor's note: Your Editor and his wife saw a similar dramatic mirage in southwestern New Mexico driving along Interstate 10 outside of Lordsburg just after sunrise in January 1998. The tops of mesas and buttes separated by several miles suddenly flatten out like pancakes and extend horizontally until they join each other like vast, hovering miles-wide saucers. A stunning effect!

Correction

In a letter to the editor by Phillips Stevens, Jr., in the May/June issue (page 66), we inadvertently dropped a line. The first two sentences of his second paragraph should have read:

"A key to this apparent paradox may be found in the link between cannibalism and witchcraft beliefs. Arens gives considerable space to the cannibalistic attributes of witches, in medieval Europe and in contemporary world ethnology."

The letters column is a forum for views on the matters raised in previous issues. Letters should be no more than 225 words. Due to the volume of letters, not all can be published. They should be double-spaced. Address: Letters to the Editor, SKEPTICAL INQUIRER, 944 Deer Dr. NE, Albuquerque, NM 87122.

ARMAGEDDON and the Prophets of Doomsday

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Thursday, July 23
Plenary 1: Millennium Prophecies
Conference Opening Address:
- Fears of the Apocalypse
  Paul Kurtz, Chairman CSICOP
- Doomsday Fantasies Among New Religious Groups
- The Bible and the Prophets of Doom
- Doomsday Prophecies
- The Bible Code

Alternative Medicine
- Homeopathy In Europe
- Why Alternative Medicine Seems to Work
- Alternative Medicine In A Scientific World
- The Fear of Amalgam Tooth Fillings in Germany

Workshop on Critical Thinking
Ad hoc Meetings: Philosophers Meeting, other meetings possible

Keynote Address
Elizabeth Loftus, Professor of Psychology, University of Washington

Friday, July 24
Plenary 2: Natural Disasters
- Predicting the Catastrophic End of Time
- Comet Hale-Bopp: Portent of Disaster?
- Doomsday: The May 2000 Prediction
- Cosmic Impacts—Do They Pose a Significant Threat?

Environmental Issues
- The Great Climate Flip-flop
- Global Warming and What We Can Do About It

Miscellaneous
- Theosophy and Anthroposophy in Education in Asia, Europe and America
- Why the Scheunen Experiments do not Prove Dowsing
- The Year 2000 Problem
- Strange Metals in Antiquity

Self-Help Groups and Cancer Information (D)
- Cancer, Multiple Sclerosis, Allergies

Critical Thinking in the Educational System (D)

German Panel/Public Participation (D)

The Psychic Market—is there a need for regulation by the State?.

Saturday, July 25
Plenary 3: Anti-Science and Post Modernists
- Intellectual Impostors
- Why People Believe
- Doomsday Prophecies

Case Studies
Paranormal & Skepticism in China
- Status Quo and Strategies in Fighting against Pseudoscience in China
- False Claims Expose and Empirical Philosophy
- The Present Publishing Situation and Evaluation of Fortune-telling Books in China
- Doomsday: Its Origin and Our Countermeasures
- Chinese Quigong Masters Scorn Pseudoscience

Alternative Medicine (D)
- Survey of Newest Studies
- Internal Consensus in Medicine Today
- Why is Alternative Medicine so Attractive?
- The Orgon Radiator
- Best Case Analyses

Ship Ride on the Neckar with special lighting effects on castles including Banquet
Hosts: Paul Kurtz, Amandeo Sarma, Richard Wiseman
With Music, Dance and Seances

Sunday, July 26
Plenary 4: Prospects for Scientific Skepticism Worldwide
- The Recovered Memory Debate
- Public Opinion and the Paranormal in the United Kingdom

GWUP members meeting

(D): German

THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL

AT THE CENTER FOR INQUIRY–INTERNATIONAL (ADJACENT TO THE STATE UNIVERSITY OF NEW YORK AT BUFFALO)
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This image, taken in August 1994 by the Hubble Space Telescope, shows "cometary knots" from a doomed star in the Helix Nebula. Each gaseous head is at least twice the size of our solar system.

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The Committee for the Scientific Investigation of Claims of the Paranormal

The Committee for the Scientific Investigation of Claims of the Paranormal encourages the critical investigation of paranormal and fringe-science claims from a responsible, scientific point of view and disseminates factual information about the results of such inquiries to the scientific community, the media, and the public. It also promotes science and scientific inquiry, critical thinking, science education, and the use of reason in examining important issues. To carry out these objectives the Committee:

- Sponsors publications
- Conducts public outreach efforts
- Maintains an international network of people and groups interested in critically examining paranormal, fringe-science, and other claims, and in contributing to consumer education
- Encourages research by objective and impartial inquiry in areas where it is needed
- Convenes conferences and meetings
- Conducts educational programs at all age levels
- Does not reject claims on a priori grounds, antecedent to inquiry, but examines them objectively and carefully

The Committee is a nonprofit scientific and educational organization.
The SKEPTICAL INQUIRER is its official journal.

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